Programa de Doctorado en Enfermería Clínica y Comunitaria

Development of Falls Prevention Model for Thai-Elderly in Community, Southern of Thailand

Tesis doctoral con Mención Internacional de Doctor

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Valencia, Febrero 2023

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CERTIFICAN

Que Uraiwan Pantong, ha realizado su tesis doctoral bajo nuestra dirección con el título de « Development of Falls Prevention Model for Thai-Elderly in Community, Southern of Thailand".

Una vez revisado el presente trabajo, consideramos que reúne las condiciones para ser presentado y defendido como TESIS DOCTORAL con mención internacional.

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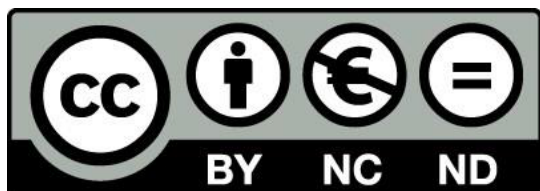
En Valencia, a 1 de febrero de 2023

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Acknowledgments

ABSTRACT

The participatory action research aimed to develop of fall prevention model for the Thai elderly in community in southern Thailand. In the development model, there were three phases: preparing, developing, and evaluating and terminating; each of them consists of planning, action, observation, and reflection.

The first phase was a mixed method consisting of a retrospective study, which obtained secondary data from elderly health screening corresponding to 20 community databases (n=12,130). Moreover, qualitative data was also collected through in-depth interviews and focus group discussions with elders and stakeholders in the community (n=50). The overall prevalence of falls was 12.1%. Independent risk factors were gender, employment status, chronic conditions, cognitive impairment, functional ability in the semi-dependent group, balance problems, vision impairment, hearing problems, medications, assistive devices, and toilets outside the house. Inductive content analysis revealed a negative perception of falls and fall prevention.

The second phase was action research using community participation and a health belief model applied to a study framework. Fifty participants were key persons in the community for collaborating in a model development, and thirty elders for evaluating the effectiveness of the fall prevention program. In the fall prevention program trial, after 16 weeks, the samples had significantly improved about strength, balance scoring, and the level of fall prevention behaviors. The participants were highly satisfied. The participatory fall prevention model in a pilot study determined: 1) the working network and the developed leadership team's capacity, 2) the project of promoting awareness through community participation, 3) the project of fall screening and home visiting, 4) the promoting exercise in the elderly club, and 5) the project of the suitable environment for the elderly.

The third phase was a forum of lesson learned in the pilot community, which yielded success factors, consisting of a strong and potential community, community awareness, and an implementation mechanism by using village health volunteer teams.

Furthermore, a representative of the pilot study presented the results of the developed model. Moreover, representatives from 20 communities participated in the forum of lesson learned to discuss and provide recommendations on the policy on fall prevention, including the development of a teleconsultation system, and integrating fall prevention projects with routine work (such as a long-term care project for the elderly and the home visiting project), in order to be sustainable projects.

RESUM

L'objectiu de la present investigació va ser desenvolupar un model de prevenció de caigudes per a la població anciana tailandesa d'una comunitat del sud de Tailàndia. El model va tindre lloc en tres fases: preparació, desenvolupament i avaluació i finalització; cadascuna d'elles consta de planificació, acció, observació i reflexió.

La primera fase va ser un mètode d'investigació mixt amb un estudi retrospectiu, en el qual es van obtindre dades secundàries dels reconeixements mèdics d'ancians corresponents a 20 bases de dades de les comunitats (n=12.130). A més, també es van recopilar dades qualitatives mitjançant entrevistes en profunditat i debats de grups focals amb ancians i parts interessades de la comunitat (n=50). La prevalença global de caigudes va ser del 12,1%. Els factors de risc independents van ser el sexe, la situació laboral, les malalties cròniques, la deterioració cognitiva, la capacitat funcional en el grup de semidependents, els problemes d'equilibri, la deterioració visual, els problemes auditius, la medicació, els dispositius d'assistència i els lavabos fora de casa. L'estudi qualitatiu va revelar una percepció negativa de les caigudes i la seua prevenció.

La segona fase va consistir en una investigació d'acció en la qual es va utilitzar la participació comunitària i un model de creences sobre la salut aplicat al marc d'estudi. Cinquanta participants eren persones clau de la comunitat per a col·laborar en el desenvolupament del model, i trenta ancians per a avaluar l'eficàcia del programa de prevenció de caigudes. En l'assaig del programa de prevenció de caigudes, després de 16 setmanes, les mostres havien millorat significativament quant a força, puntuació de l'equilibri i nivell de conductes de prevenció de caigudes. Els participants es van mostrar molt satisfets. El model participatiu de prevenció de caigudes en un estudi pilot va determinar: 1) la xarxa de treball i la capacitat de l'equip de lideratge desenvolupat, 2) el projecte de promoció de la conscienciació a través de la participació comunitària, 3) el projecte de detecció de caigudes i visites a domicili, 4) la promoció de l'exercici en el club d'ancians, i 5) el projecte de l'entorn adequat per als ancians.

La tercera fase va ser un fòrum de lliçons apreses en la comunitat pilot, que va revelar una comunitat forta i amb potencial, la conscienciació de la comunitat i un mecanisme d'aplicació del model mitjançant equips de voluntaris sanitaris del poble. Un representant de l'estudi pilot va presentar els resultats del model desenvolupat. Representants de 20 comunitats van participar en el fòrum de lliçons per a debatre i oferir recomanacions sobre la política de prevenció de caigudes, inclòs el desenvolupament d'un sistema de teleconsulta, i la integració dels projectes de prevenció de caigudes amb el treball rutinari (com un projecte de cures a llarg termini per a ancians i el projecte de visites a domicili), amb la finalitat que siguen projectes sostenibles.

Resumen Global de la tesis

1. Introducción

Hoy en día, la población de edad avanzada en todo el mundo está aumentando. Según la Organización Mundial de la Salud (OMS, 2011), se prevé que el número de personas de 60 años o más aumente al menos un 3% por año. Para 2030, se predijo que sería de aproximadamente 1.400 millones de personas y aumentará a 2.000 millones para 2050.

En Tailandia, la tasa de la población anciana fue la tercera más grande en Asia después de Corea del Sur y Japón. Según la 6ª encuesta de población anciana tailandesa (Aekplakorn, Puckcharern y Satheannoppakao, 2021), había 11,1 millones de ancianos, y se predijo que Tailandia será una sociedad completamente envejecida en 2031 cuando al menos el 20% de la población tenga 60 años o más (Foundation of Thai gerontology research and development Institute, 2021).

El aumento de esta población hace que el país se enfrente a problemas de salud derivados de muchos síndromes geriátricos, incluido el problema de las caídas. Un aumento en la población de edad avanzada conducirá a un aumento en la carga de cuidar de esta población y esto afecta a la economía, la sociedad y la salud.

Las caídas son una causa importante que hace que los ancianos se lesionen, discapaciten y dependan, incluso pueden resultar en la muerte eventualmente. A nivel mundial, se producen caídas en el 30% de los adultos mayores de 65 años anualmente (Ganz, & Latham, 2020), mientras que entre los ancianos tailandeses se ha visto que el 15,3% de los adultos mayores se caen cada año (Aekplakorn, Puckcharern, & Satheannoppakao, 2021). Sin embargo, la mayoría de las caídas pueden evitarse con la prevención primaria y el tratamiento de los factores de riesgo identificados, por lo que la prevención de las caídas entre las personas mayores es un problema urgente de salud pública. Representa un reto considerable para la salud pública en Tailandia, especialmente para los ancianos que viven en sus casas en comunidades rurales que carecen de intervenciones para prevenir las caídas.

Las directrices mundiales para la prevención y el tratamiento de las caídas en los adultos mayores (Manuel Montero-Odasso et al., 2022) recomiendan que se asesore a todos los adultos mayores sobre la prevención de caídas y la actividad física, y recomiendan detectar el riesgo de caídas entre los adultos mayores que viven en la comunidad. Al grupo

de alto riesgo se le debe ofrecer una evaluación integral multifactorial del riesgo de caídas e implementar intervenciones multifactoriales individualizadas. Los estudios sobre la prevención de caídas entre los ancianos tailandeses en la comunidad encontraron muchas limitaciones para un modelo sostenible. De ahí que deba emplearse la teoría de la participación comunitaria (Cohen & Uphoff,1981) en el modelo de prevención de caídas. El modelo de creencias de salud (HBM) (Becker et al.,1977) ha sido ampliamente utilizado para comunicarse con las personas mayores para cambiar sus comportamientos y actividades de adherencia. Este es el modelo de desarrollo de este estudio.

Con esto, la presente investigación tuvo como principal objetivo desarrollar un modelo de prevención de caídas para los ancianos en la comunidad del sur de Tailandia y averiguar qué proceso y recurso en la comunidad promueven formas sostenibles de prevenir caídas para los ancianos en la comunidad y qué podemos hacer para cambiar los comportamientos y reducir los factores de riesgo de caídas entre los ancianos con la participación de la comunidad. En este estudio, el concepto de participación comunitaria y la teoría del modelo de creencias en salud (Becker et al., 1977) se emplearon en el proceso de desarrollo. Esta investigación se dividió en 3 fases: 1) el pre-desarrollo, 2) el desarrollo del modelo de prevención de caídas con la participación de la comunidad, y 3) la evaluación y fin del desarrollo. La investigación-acción participativa se aplicó de acuerdo con el concepto de Kemmis y Mc Taggart (Kemmis & Mc Taggart, 1988), consistente en evaluar y planificar, actuar y observar, reflexionar y un plan revisado que se implementará en el ciclo hasta obtener un modelo satisfactorio de práctica. El marco conceptual de la investigación se refleja en la Figura 1.

Análisis situacional y preparación para el desarrollo

Estudiar la situación de las caídas entre los ancianos en 20 Subdistricts seleccionados en 7 provincias

Proporcionar la situación de las caídas y proponer ideas de desarrollo a 20 comunidades participantes en el estudio

Discusión y sugerencias entre las partes interesadas de 20 comunidades

Sugerencias de expertos (académico, fisiólogo y enfermera comunitaria)

Elaboración de un modelo para prevenir caídas entre los ancianos en las comunidades del sur

Desarrollo del modelo

El borrador del modelo se probó con una comunidad piloto seleccionada entre 20 comunidades

Aclaración de la comunidad

Analizar problemas / formular un plan de desarrollo
Técnica A-I-C: Apreciación- Influencia-Control

Uno programa de seguimientos

Una lección aprendida en la comunidad

Evaluación y terminación

Los resultados del desarrollo del estudio piloto se presentaron a 20 comunidades

20 comunidades se unen al foro para tomar lecciones y dar retroalimentación

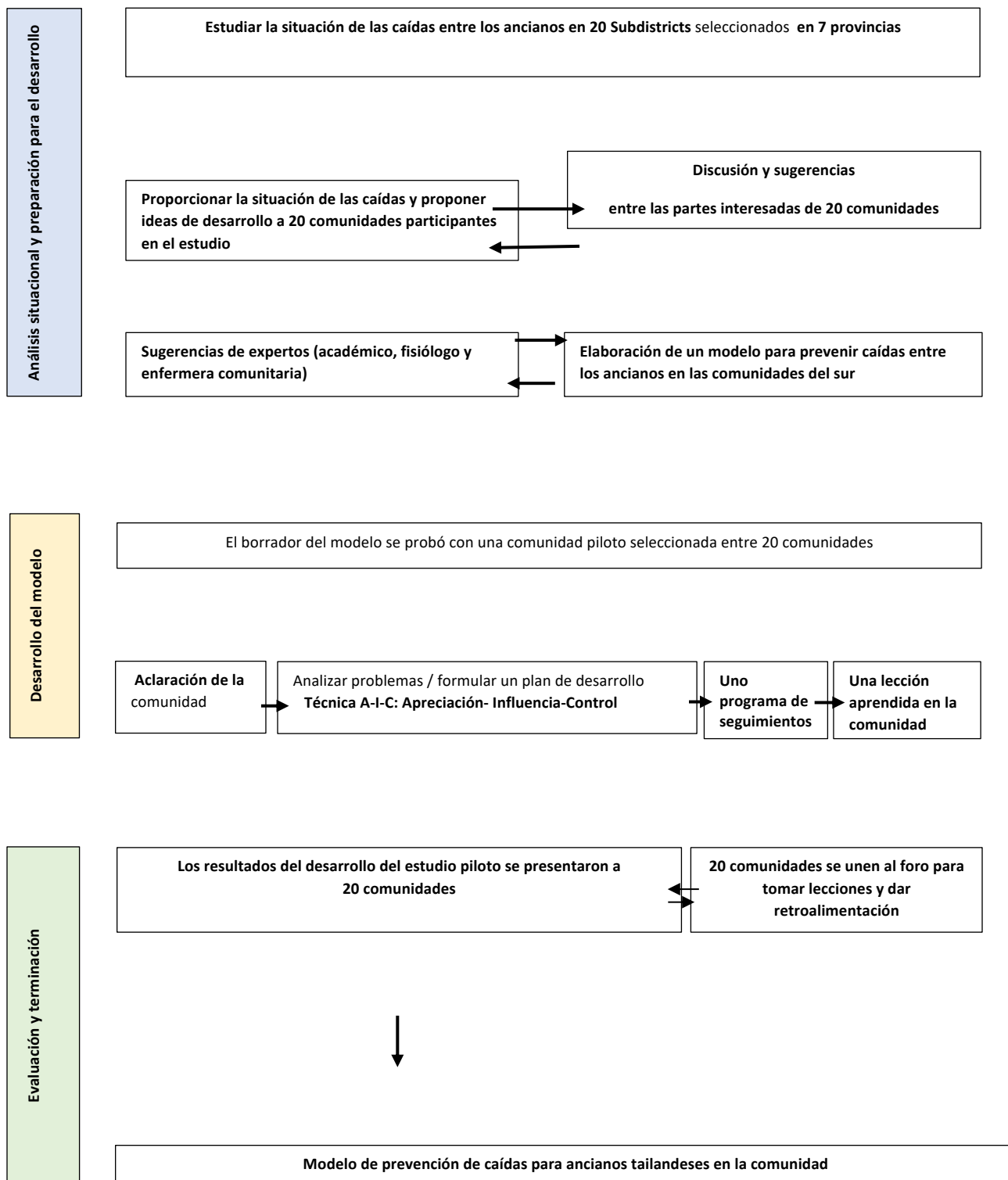Modelo de prevención de caídas para ancianos tailandeses en la comunidad

Figura 1: Un marco de estudio conceptual basado en los conceptos de Kemmis y McTaggart (1988), el concepto de participación comunitaria (Cohen y Uphoff, 1980) y la teoría del modelo de creencias en salud (Becker et al., 1977)

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2. Objetivos y cuestiones a investigar

Objetivos

1) Examinar las circunstancias de las caídas de las personas mayores en comunidad en el sur de Tailandia.

2) Desarrollar un modelo de prevención de caídas para las personas mayores en comunidad en el sur de Tailandia.

3) Evaluar el modelo y determinar los factores de éxito del mismo.

Cuestiones a investigar

Cuestiones a investigar primarias:

1) ¿Cuál es la situación de las caídas de los mayores en comunidad en el sur de Tailandia antes del desarrollo de este estudio?

2) ¿Cuál es la situación de las caídas de los mayores en la comunidad piloto antes del desarrollo de este estudio?

3) ¿Cuáles son las medidas de prevención para las caídas de los mayores antes del desarrollo de este estudio?

Cuestiones a investigar secundarias:

1) ¿Cuáles son las componentes del modelo participativo de prevención de caídas en la comunidad piloto?

2) ¿Cuáles son los mecanismos para implementar el modelo participativo de prevención de caídas en comunidad?

3) ¿Cuáles son los resultados del modelo de prevención de caídas desarrollado en la comunidad piloto?

4) ¿Cuáles son los problemas y soluciones en la implementación del modelo participativo de prevención de caídas?

3. Metodología

El presente trabajo es una Investigación de Acción Participativa o IAP (en inglés, Participatory Action Research o PAR), enfocada al desarrollo de un modelo de prevención de caídas para las personas mayores en comunidad en Tailandia, utilizando métodos mixtos

para la recogida de datos (Sendall et al., 2018). El estudio consta de tres fases: preparación, desarrollo y evaluación. Cada una de ellas se divide a su vez en: planificación, acción, observación y reflexión.

La **primera fase** se centra en analizar la situación de las caídas en personas mayores en comunidad, en Tailandia. Se utiliza un método mixto consistente en un estudio cuantitativo, mediante el cual se obtienen datos secundarios a partir de los informes de salud de los mayores, procedentes de 20 bases de datos comunitarias. Además, se ha realizado también un estudio cualitativo a partir de entrevistas en profundidad (in-depth interviews) y discusiones de grupo focal (focus group discussions), incluyendo tanto mayores como agentes relevantes de la comunidad.

La **segunda fase** es el desarrollo del modelo aplicando el procedimiento de Kemmis & McTaggart (1988), que consta de: planificación, acción, observación y reflexión. Para poder evaluar la efectividad del programa de prueba de prevención de caídas participaron 30 personas mayores durante 16 semanas.

La **tercera fase** es un foro de lección aprendida con 50 agentes de la comunidad piloto para encontrar los factores de éxito y los mecanismos operativos que conducen al éxito. También hubo un foro de lección aprendida entre representantes de 20 comunidades, con un total de 50 ejecutivos y expertos, que utilizaron los resultados del modelo para debatir y proporcionar recomendaciones sobre las políticas de prevención de caídas. El marco conceptual se muestra en la Figura 2.
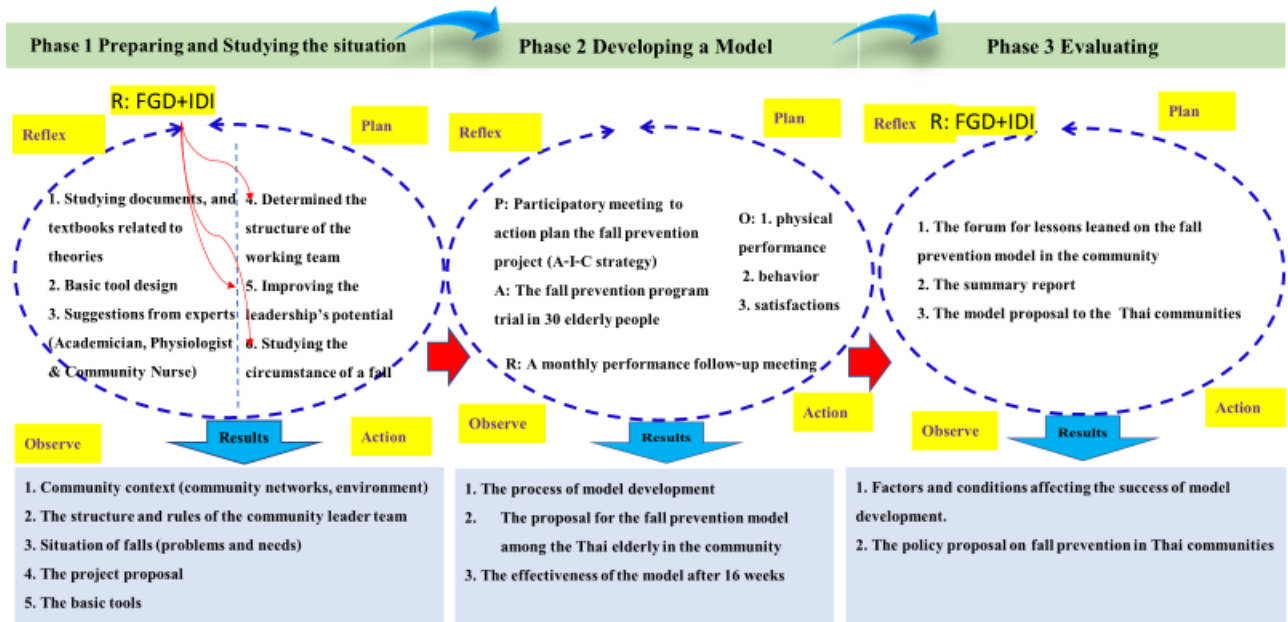
Figura 2. **Desarrollo del modelo de prevención de caídas en los ancianos con la participación de la Comunidad.**

3.1 Participantes y muestras

La primera fase se centra en el análisis de la situación de las caídas en 20 subdistritos del sur de Tailandia con una población total de gente mayor de 31,530. El listado de dicha gente mayor se obtuvo de una base de datos facilitada por directivos de cuidados primarios. Tras excluir aquellos cuyos datos eran incompletos en relación con los objetivos de este estudio, el número de participantes considerado fue de 12,130, es decir, el 38.5% del total. Los informantes de las discusiones de grupo focal y entrevistas en profundidad se eligieron mediante muestreo intencional entre administradores de hospitales de promoción de la salud de subdistritos y de organizaciones administrativas de subdistritos (Subdistrict Administrative Organizations o SAO), sumando un total de 20 personas. Ellos suministraron la información sobre el problema de la prevención de caídas. Por su parte, las muestras para el estudio de la percepción de las caídas estaban formadas por 30 representantes de los mayores y 20 agentes involucrados en atención a los mayores de la comunidad piloto durante al menos un año, lo que suma un total de 50 personas.

En la segunda fase se eligieron 350 personas mayores, de acuerdo con la ecuación de Yamane, mediante muestreo aleatorio, así como 40 agentes relevantes que mostraron su deseo de participar en el modelo de prevención de caídas. La efectividad del programa de prevención de caídas se evaluó mediante un diseño casi-experimental de grupo único pretest-postest (quasi-experimental, one-group pretest-posttest design). Los tamaños de las muestras se calcularon mediante el método de análisis de potencia. La potencia de test de 0,80 determinó una significación estadística de 0,05 y un tamaño del efecto de 0,80. El tamaño de la muestra obtenido fue de 26 personas pero, para prevenir posibles pérdidas de datos, este número se aumentó a 30. El criterio de inclusión fue de personas de 60-75 años de edad, con un índice de Barthel mayor o igual que 12 de 20, un tiempo "up and go" (TUG) de más de 13.5 segundos, sin enfermedades severas subyacentes, capaces de hablar y escribir en tailandés y con consentimiento informado. El criterio de exclusión fue de limitaciones para ejercicios especificados por el médico responsable o que hayan participado en otros programas de ejercicios dentro de los seis meses anteriores.

En la tercera fase, el grupo de participantes en el foro de lección aprendida estaba formado por representantes de las personas mayores, agentes relevantes de 20 subdistritos, ejecutivos y líderes comunitarios, resultando un total de 50 personas.

3.2 Instrumentos para la recogida de datos

1. En la primera fase, los datos cuantitativos se recogieron mediante cuatro herramientas: 1) la base de datos JHCIS (Joint Health Command Information System), para obtener datos secundarios de 20 subdistritos de 7 provincias; 2) un cuestionario sobre el histórico de caídas y sus factores relacionados en el estudio piloto; 3) la evaluación del entorno doméstico; y 4) un cuestionario sobre el comportamiento de prevención de caídas relativo a la percepción de las caídas. Este cuestionario consta de 25 preguntas, todas ellas cuestiones positivas en la escala de calificación de Likert. A la actividad regular se le asigna un 3, a la práctica ocasional un 2 y a ninguna práctica un 1. La interpretación de la

puntuación media se clasifica en tres niveles: 2.34–3.00 representan un nivel alto, 1.67-2.33 un nivel moderado y 1.00-1.66 un nivel bajo.

2. En la segunda fase, las herramientas para verificar la efectividad del programa consistieron en: 1) el tiempo "up and go" (TUG) (Barry, Galvin, Keogh, & Fahey, 2014); 2) la permanencia en la silla durante 30 segundos (Rikli &Jones, 1999); 3) el test de equilibrio de 4 etapas (Phelan, Mahoney, Voit, & Stevens, 2015); 4) el cuestionario sobre el comportamiento de prevención de caídas; y 5) un cuestionario sobre la satisfacción de los participantes con el proyecto, consistente en 10 preguntas y con una escala de puntuación de 1 a 5 niveles, siendo 5 el nivel máximo de satisfacción y 1 el mínimo. La puntuación media se clasifica en tres niveles: 3.67-5.00 representan un nivel alto, 2.34-3.66 un nivel moderado y 1.00-2.33 un nivel bajo.

3. Los datos cualitativos se recogieron mediante observaciones, discusiones de grupos focales, entrevistas en profundidad con preguntas abiertas y grabaciones de las reuniones mensuales. Se desarrolló un taller de planificación del programa utilizando la técnica AIC (Appreciation-Influence-Control). El grupo focal de problemas de prevención de caídas y el foro de lección aprendida utilizaron preguntas abiertas estructuradas creadas por el investigador y que habían sido probadas en representantes de las personas mayores. Contenían un conjunto de preguntas principales, otro de subpreguntas y otro de preguntas profundas. Además, la participación de los agentes fue observada y evaluada a lo largo del estudio.

3.3 Validación de los instrumentos

1) Validación del contenido: todos los instrumentos fueron verificados por tres personas cualificadas para evaluar que el lenguaje era apropiado, utilizando el índice del Item Objective Congruence (IOC).

2) La fiabilidad fue evaluada probando los instrumentos corregidos mediante recomendaciones de expertos en 30 muestras de un subdistrito, en la provincia de Nakhon Si Thammarat. Esta área era similar cultural y socialmente, así como en su forma de vida, al

área bajo estudio, lo que permitió valorar la claridad de las preguntas y la comprensión del lenguaje, de acuerdo con el coeficiente alfa de Cronbach. Los resultados fueron:

1) En el cuestionario sobre el comportamiento de prevención de caídas, el coeficiente alfa de Cronbach fue de 0.85.

2) En el cuestionario sobre la satisfacción de las personas mayores, el coeficiente alfa de Cronbach fue de 0.9.

3.4 Análisis estadístico

Los datos cuantitativos se analizaron mediante el software SPSS (versión 25, SPSS, Inc., Chicago, IL, USA). Para describir las características de la prevalencia de caídas se utilizaron las estadísticas descriptivas de frecuencias y porcentajes. Para establecer las categorías de las variables se utilizaron tests Chi cuadrado de tabulación cruzada, distinguiendo entre personas que se caen y que no se caen (Tabla 1). Las variables significativas ($p < 0.05$) se utilizaron para realizar los análisis de regresión logísticos binarios (Tabla 2). En primer lugar, mediante un análisis univariable, se obtuvieron las proporciones de probabilidad crudas (odds ratios u OR) y los intervalos de confianza (confidence intervals o CI) del 95%. A continuación, se utilizó un análisis multivariable usando el "enter method" para identificar los factores de predicción de caídas, de donde se obtuvieron los correspondientes OR ajustados y los CI del 95%.

Los datos cualitativos se analizaron mediante análisis de contenidos, consistentes en tomar los datos de campo crudos y hacer una lectura analítica. Se utilizó la reducción de datos para seleccionar los contenidos, interpretarlos y clasificarlos en categorías, con el fin de resumir cada punto.

4. Permisos y consideraciones éticas

Todos los participantes facilitaron un consentimiento informado, tanto oral como escrito. La autorización ética fue aprobada por el comité de revisión ética del Research

Involving Human Research Subjects, Health Sciences Group, Walailak University (WUEC-19-068-01).

5. Procedimientos para el manejo de datos

Los investigadores estudiaron los conceptos y teorías relacionados con la prevención de caídas en personas mayores, en sus diferentes dimensiones, a través de documentos, investigaciones, guías estándar y manuales. Así mismo, el equipo de investigación asistió a las reuniones del proyecto "Development and Research for Elderly Care by Local Communities" y propuso como objetivo del proyecto "el desarrollo de un modelo de prevención de caídas para mayores en comunidades del sur", invitando a 20 comunidades a participar en el proyecto. Adicionalmente, se coordinaron con representantes de esas 20 comunidades (subdistritos) para solicitar datos secundarios de caídas de gente mayor en cada área. Y también se coordinaron con los agentes relevantes del área de la comunidad piloto para solicitar su cooperación para comprender los objetivos de la investigación, los planes de acción y la recogida de datos.

Fase 1: Estudio de la situación de las caídas en personas mayores en comunidad, en Tailandia

Los datos secundarios de los informes de salud de los mayores provienen de la base de datos JHCIS y corresponden a 20 hospitales de promoción de la salud de subdistritos. Por su parte, el estudio cualitativo se obtuvo mediante entrevistas en profundidad y discusiones de grupo focal entre personas mayores y agentes de la comunidad. Así mismo, se estudiaron los archivos comunitarios para entender el contexto de la comunidad piloto. El establecimiento de las relaciones entre las personas se hizo usando el principio de "aproximación, alcance y comprensión". Los datos sobre los problemas de prevención de caídas se obtuvieron mediante discusiones de grupo focal entre 40 agentes de la comunidad. La situación de las caídas se documentó a través de un cuestionario realizado a 350 personas mayores. Adicionalmente, los agentes fueron invitados a asistir a un taller para desarrollar la capacidad de prevención de caídas y participar en el diseño de la estructura del grupo de trabajo y definir los roles y responsabilidades, así como para seleccionar a los voluntarios.

Fase 2: Desarrollo del modelo

Planificación:

Se organizó un taller AIC, cuyos participantes fueron 40 agentes relevantes. A la vez que los moderadores dirigían el taller, un investigador se dedicaba a observar, recoger los datos y evaluar los resultados. El factor A (Appreciation) consistía en analizar de forma conjunta los problemas de las caídas de los mayores que habían participado y establecer un modelo de prevención de caídas deseable. El factor I (Influence) era la puesta en común de ideas y el diseño de un programa que respondiera al concepto de modelo de prevención de caídas deseable basado en la situación y el contexto comunitario. Y el factor C (Control) consistía en formular un plan de acción, definiendo los tipos de personas según los roles y responsabilidades de cada actividad.

Acción:

La implementación del plan consta de dos subproyectos, que son los siguientes:

1. Campaña del proyecto en la comunidad:

Los participantes eran personas de la comunidad. La campaña publicitaria constaba de propaganda e ideas sencillas comunicadas a través de la radio comunitaria todos los sábados y domingos. En las asociaciones de personas mayores, se recomendaba un ejercicio para aumentar la fuerza muscular y el equilibrio una vez por semana y en las clínicas para enfermedades crónicas de los hospitales de promoción de la salud, una vez al mes. La modificación del entorno se promovía mediante un cartel propagandístico en los principales puntos de la comunidad. Las actividades eran dirigidas por voluntarios de la salud entrenados en las poblaciones. Los datos de participación se recogían mediante impresos de observación.

2. Programa de prevención de caídas multifactorial basado en el hogar

Se realizó un estudio casi-experimental para evaluar los programas de prevención de caídas basado en el hogar para 30 personas mayores de la comunidad entre junio de 2020 y octubre de 2020, durante 16 semanas. Los criterios de inclusion fueron: 1) personas

de 60-75 años de edad; 2) un valor del test de TUG de más de 13.5 segundos; 3) un valor del índice ADL de Barthel mayor o igual que 12; y 4) una buena comprensión del idioma tailandés. Los criterios de exclusión fueron: 1) limitaciones para el ejercicio especificadas por el responsable médico; y 2) el rechazo a participar en el programa.

Durante la primera semana, los participantes asistieron a dos conferencias educativas sobre la percepción de las caídas, basadas en el Health Belief Model (HBM). Los contenidos sobre la concienciación incluían la percepción de la susceptibilidad (creencia sobre la posibilidad de una caída), percepción de la severidad (creencia sobre la gravedad de la caída), percepción de los beneficios (creencia en la eficacia del programa de ejercicios) y las barreras físicas debidas a las caídas. Además, los participantes asistieron a una sesión de entrenamiento basada en el "Otago exercise program" (OEP) con fisioterapeutas y enfermeras entrenadas.

Durante la segunda y la tercera semanas, las enfermeras específicamente entrenadas y los voluntarios de salud de la población (village health volunteers o VHV) visitaron a los participantes en sus casas para evaluar los riesgos en el entorno del hogar y revisar su medicación. A los participantes se les entregó un folleto informativo y se les indicó que practicaran los ejercicios en casa 3 días a la semana, 30 minutos cada vez, además de andar 10 minutos, todo ello durante 16 semanas. En cada visita a una casa, el asesor se basaba en el concepto HBM para aumentar la implicación en la actividad desarrollada. También se colocaba un póster en la casa que ilustraba el ejercicio, junto con las instrucciones. Estas incluían 5 minutos de actividades de calentamiento, 5 minutos de estiramientos, 12 minutos de ejercicios de equilibrio y 10 minutos de andar (Yang et al, 2022). Esto se controlaba mediante una visita a la casa por parte de un VHV una vez por semana, mientras que las enfermeras entrenadas contactaban por videoconferencia mediante la aplicación Line dos veces al mes para asesorar y mantener la motivación.

Observación:

Los investigadores observaban y grababan la actuación del agente durante el desarrollo del proceso objeto de estudio, incluyendo la grabación del ejercicio personal

para evaluar su continuidad, el registro de la visita a la casa y un informe de reunión mensual.

Reflexión:

En las reuniones mensuales se informaba de los resultados del control del programa por parte del grupo de trabajo en la comunidad a lo largo del proyecto, lo que se complementaba con las campañas publicitarias y la resolución de los problemas detectados en dichas reuniones, incluyendo cuestiones de recursos de gestión y problemas de intercomunicación.

Fase 3 Evaluación

1) El foro de lección aprendida de la comunidad piloto constaba de 50 personas, entre representantes de las personas mayores y agentes. Las discusiones de grupos focales analizaban los puntos principales de los resultados para confirmar el éxito, los factores de éxito, retos, soluciones y necesidades de desarrollo.

2) El foro de lección aprendida de la comunidad piloto se eligió para proponer una política de prevención de caídas.

4. Conclusiones

Como se ha comentado, la presente tesis desarrolla un modelo de prevención de caídas en los ancianos se ha llevado a cabo en la comunidad piloto, el subdistrito de Sa Kaew, distrito de Tha Sala, provincia de Nakhon Si Thammarat, Tailandia a través de la investigación de acción participativa (PAR) con 3 fases de preparación, desarrollo y evaluación. Cada etapa consta de cuatro pasos principales: planificación, acción, observación y reflexión. El estudio se realizó desde octubre de 2019 hasta enero de 2021 con 3 fases diferenciadas: un primer análisis de la situación de caídas, la preparación, el desarrollo de un modelo de prevención de caídas y la evaluación. Pasamos a resumir las conclusiones extraídas del estudio:

1) La cooperación de los posibles líderes comunitarios es un mecanismo para impulsar la prevención de caídas en la comunidad, y la colaboración puede hacer que un proyecto sea sostenible.

2) El proceso de desarrollo de un modelo comunitario participativo de prevención de caídas hizo que las partes interesadas comprendieran la gravedad de las caídas entre los ancianos y les llevó a participar en la determinación de los modelos de prevención de caídas de forma adecuada.

3) Las enfermeras comunitarias son responsables de educar y aumentar la concienciación sobre la prevención de caídas entre la población. Además, el papel de las enfermeras como formadoras y mentoras de los voluntarios sanitarios del pueblo puede funcionar de forma eficiente y segura.

Como futuras líneas de investigación para continuar en el estudio se propinen:

(1) Debe integrarse un programa de prevención de caídas con el proyecto de atención a largo plazo para los ancianos para implementar el programa de manera sostenible. En este sentido, el modelo de este estudio puede utilizarse en otras comunidades tailandesas.

(2) Desarrollar un sistema de teleconsulta en grupos de alto riesgo en la comunidad.

(3) Diseñar una propuesta de política con énfasis en la implementación proactiva y presentar un modelo de prevención de caídas para los ancianos en la comunidad a los administradores de la organización administrativa local y la salud pública provincial para apoyar el presupuesto, los medios de comunicación y los oradores.

(4) También debería realizarse un estudio longitudinal para determinar la sostenibilidad del programa.

Limitaciones del estudio

1) En cuanto a las modificaciones del entorno, hay algunas familias con dificultades económicas. Además, el gobierno local tiene un límite de recursos financieros para ayudar

a las familias en todas las casas peligrosas. Por lo tanto, la asistencia debe clasificarse por gravedad.

2) La crisis COVID-19 provocó limitaciones en el número de personas y lugares para las actividades de prevención de caídas. Creamos un canal de comunicación a través de videollamadas, Line group chat para reunirnos en línea entre los participantes, los investigadores y las partes interesadas.

3) La eficacia del programa de prevención de caídas se comprobó justo después de su finalización. Sin embargo, no se puede esbozar el impacto a largo plazo.

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Chapter 1. INTRODUCTION

Chapter 1. Introduction

1. Background and Significance

Nowadays, the elderly population around the world is increasing. According to the World Health Organization (WHO, 2011), the number of people aged 60 years old and over was predicted to increase by at least 3% per year. By 2030, it was predicted to be about 1.4 billion people and it will increase to 2 billion by 2050. In Thailand, the rate of the elderly population was the third largest in Asia after South Korea and Japan. According to the 6th Thai elderly population survey (Aekplakorn, Puckcharern, & Satheannoppakao, 2021), there were 11.1 million elderly, or 16.7 percent, and this was expected to increase by 20 percent in 2021, and it was predicted that Thailand will enter a super aged society in 2031 when the population aged 60 years old and over is more than 28% of the population. An increase in the elderly population will lead to an increase in the burden of taking care of this population. It affects the economy, society, and health. Falls are another major cause, causing the elderly to be injured, disabled, and dependent, and may result in death eventually.

Falls among the elderly are becoming increasingly important in every region in the world. Falls are one of the geriatric syndromes that result from old age and various illnesses which are both predisposing factors and precipitating factors that cause falls. Based on the report of falls in people aged 65 years old and over in the United States, more than 36 million elderly people fell once a year, and 1 in 5 people need to be treated in emergency centers due to the injury. Additionally, about 300,000 people were hospitalized for hip injuries each year, and about 32,000 passed away from falls each year (Bergen, Stevens, & Burns, 2014). In addition, the elderly who fell once would fall again and there was a risk of a repeated fall (O'Loughlin, 1993). For the incidence of falls among the elderly in Thailand, based on the 5th Thai National Health Examination Survey 2014 (Aekplakorn, 2016), 16.9% of the elderly experienced falls. Female elderly fell 1.5 times higher than males. The older elderly was more likely to fall again. The incidence of falls in the elderly aged 60-69 years old was 8.2-12.2 percent and 10.9-17.9 percent in those aged 70-79 years old. Among the elderly aged 80 years old and over, it was up to 10.3-14.3 percent. Moreover, a report from the Bureau of Epidemiology, the Ministry of Public Health (2018) found that the proportion of severe injuries from falls among the elderly tended to

increase. In 2018, there were 22.2% severe injuries of all serious injuries. The proportion of mortality from falls was 17.0% of all-cause mortality. The mortality rate from falls was higher than in all age groups and tended to increase continuously, especially in those aged 70 years old and over at 29.13%, while the group of 60 - 69 years old was 14.4%. The mortality rate from falls among the female to male elderly was 1:1.3.

Falls among the elderly cause multidimensional effects, including both physical and mental problems as well as social and economic aspects. The physical effect includes injuries to various vital organs, including head and brain injuries and fractures of the pelvis. Severe injuries require a long stay in the hospital and may pass away later or may develop disabilities and loss of ability to perform daily activities. For the mental effect, some elderly who fell once lost confidence in their movements due to worry and fear of falling again and cannot spend a normal life, resulting in isolating themselves from the society. As a result, the elderly had a decreased quality of life (Meiner, 2012). For the economic aspect, relatives lost their time at work to take care of them due to a disability. This includes the loss of the country's economy to take expenses in the health service system when the elderly has broken bones or disability, etc.

Falls among the elderly are caused by four major causes or factors (Deandrea et al., 2010; Lusardi et al., 2017), namely 1) biological factors, which some factors cannot be changed, such as age, gender, ethnicity, or those related to aging, such as physical deterioration, ability to recognize and emotional adjustment as well as causes related to various chronic diseases, 2) behavioral risk factors, including those related to behaviors in daily life which can be modified, such as risky behavior in drinking alcohol, taking multiple medications which may have side effects on the nervous system and the cardiovascular system or drugs that affect blood pressure changes, daily hurry behaviors, and inappropriate clothes or shoes, 3) environmental risk factors, including the public, home, and outside the home that is dangerous for the elderly, such as too much or too little light, slippery, wet, different levels of floors, stairs in the house without holders, unarranged things, etc. 4) economic and social risk factors, including low income, low education, and insufficient housing, lack of social interaction, inadequate access to health services, and lack of social care, especially in remote rural areas that lack community resources to provide an adequate fall prevention care system.

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Regarding fall prevention among the elderly, it was found that various fall prevention models among the elderly were developed (Centers for Disease Control and Prevention,2014; Sherrington et al.,2019), including an activity-based model, such as exercises to increase muscle strength, stability in standing to facilitate gait and balance or combined exercises, including education and improvement on a safe environment (Li, Harmer & Fitzgerald, 2016; Rimland et al., 2016) and a multi-factor activity-based model or a model that emphasizes inclusive risk prevention in all dimensions (Gillespie et al, 2012; Guirguis-Blake et al., 2018), such as educational activities combined with exercise and reduction of various risk factors based on the context of the elderly individually and in groups. Various models developed have differences in terms of the target audience, areas used in the study, methods, and assessment. Therefore, it cannot be concluded which method is the most effective in preventing falls in each age group of the elderly.

Regarding fall prevention, the Centers for Disease Control and Prevention (CDC, 2008) introduced approaches and raised awareness of falls among the elderly to adjust self-care behaviors to cover the elderly, their family, and those who grow old in the future as well as those who play a role in policy making and in the elderly care in the community. The preventive approaches include 1) education to enhance preventive behaviors and reduce the risk of falling, 2) exercise promotion, 3) stretching exercises and flexibility of various joints, muscle strength training, and walking and balance to promote physical potential to the maximum potential, 4) mental rehabilitation of the elderly, and 5) the improvement of the home environment to be safe.

Based on a systematic literature review, even though a multifactor fall protection model has proven to be effective in preventing falls in all studies in the Southern community (Gillespie et al., 2012; Guirguis-Blake et al., 2018; CDC,2008; American Geriatrics Society and British Geriatrics Society, 2011), it may not be applicable to the community in the context of Thai culture as a whole since the way of life, environment, and culture in Thailand are different. According to a literature review, despite the research and development of various programs domestically and internationally to prevent falls among the elderly while being treated in hospitals and in the community, most of the research was conducted exclusively on the elderly and their family caregivers. There is a study on cooperation from network partners in the minority communities

(Jitramontree et al., 2015) which has made the fall prevention model unsustainable for the prevention and care of the elderly in the community. The elderly care in Thai communities is now responsible by the department of local administration and primary health care facilities. This requires the development of prevention and care models for the elderly as well as a public policy in the community that contributes to the quality of life of the elderly.

The study on the development of fall prevention models among the elderly in the community is action research with community participation and the capital. The researcher assessed the capital readiness and potential of the community, studied the context and situation of falls in the area, and proceeded to develop the model together with those who play a role in the elderly care in the community, such as the elderly, family caregivers and network partners in the community, consisting of a department of local administration, village headmen, staff of sub-district health promoting hospital and village health volunteers (VHV), as well as leaders of various groups in the community. The participatory action research was conducted according to Kemmis and McTaggart's concept (Kemmis & Mc Taggart, 1988), which included the analysis and assessment of falls, development of a fall prevention model for the elderly, a trial of a fall prevention model among the elderly, and evaluation and improvement of the model in accordance with the lifestyle of the elderly in the community by integrating with health belief models and Otago programs to create the appropriate fall prevention model for the elderly in the community and a movement to take care of the elderly to reduce the risk of falls in the community that is a sustainable system to develop into a model community of fall prevention among the elderly in other communities.

2. Conceptual Framework

The participatory action research to develop the fall prevention model for the elderly in the Southern community is to figure out which process and resource in the community promote sustainable ways to prevent falls for the elderly in the community and what can we do to change behaviors and reduce risk factors for falls among the elderly in the community with the community participation which is a suitable model for the context and lifestyle of the elderly in the area. In this study, the concept of community participation and health belief model theory

(Becker et al., 1977) were employed in the development process. This research was divided into 3 phases: 1) the pre-development, 2) the development of the fall prevention model with the community participation, and 3) the evaluation and end of development. Participatory action research was applied according to Kemmis and Mc Taggart's concept (Kemmis & Mc Taggart, 1988), consisting of assessment and planning, acting, and observing, reflecting, and a revised plan to be implemented in the cycle until a satisfactory model of practice is obtained. The research conceptual framework was shown in Figure 1.

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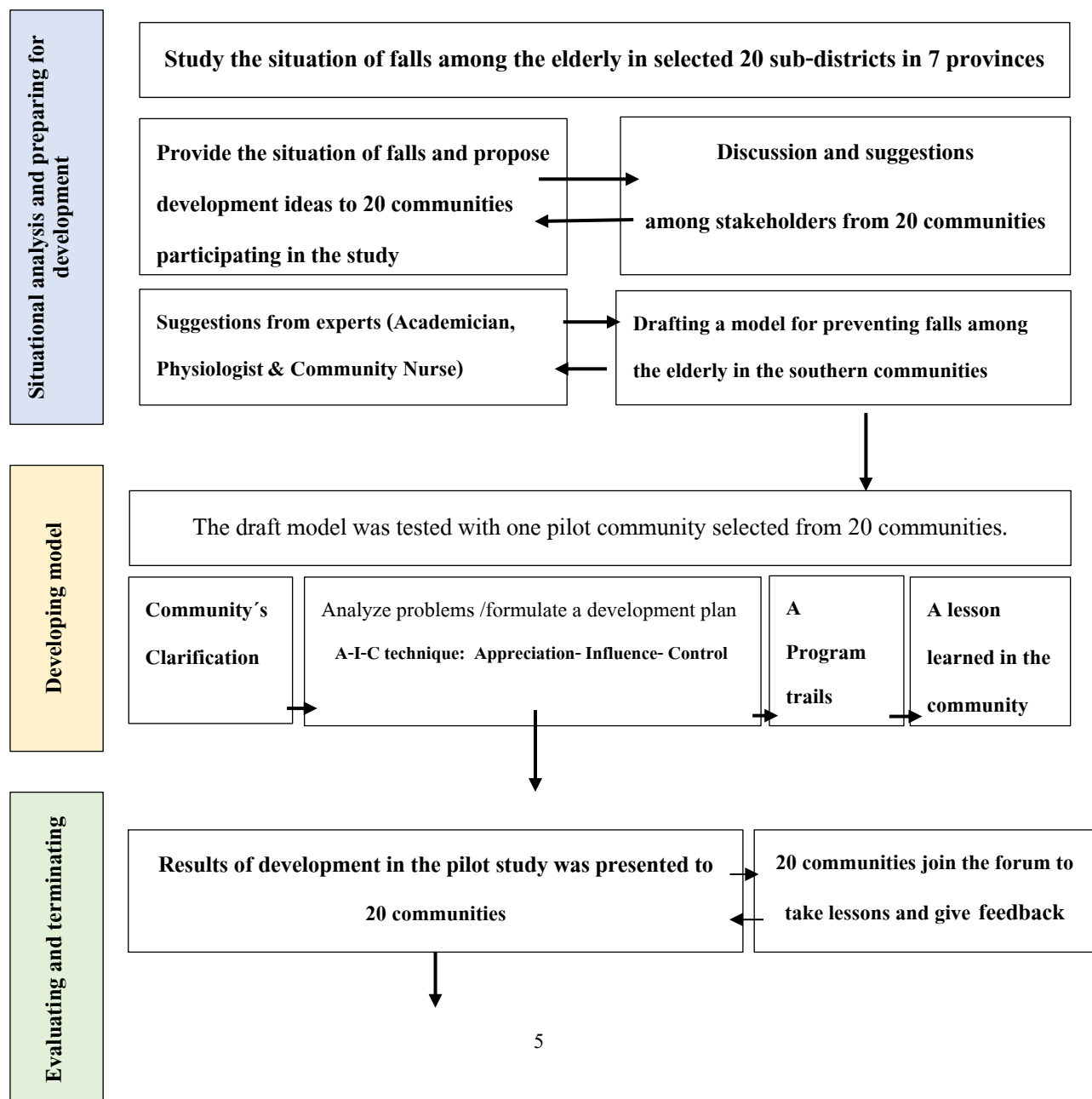
Figure 1: A conceptual study framework based on Concepts of Kemmis & McTaggart (1988), the concept of community participation (Cohen & Uphoff, 1980), and health belief model theory (Becker et al., 1977)

3. Definition of Terms

Falls refer to a sudden change of the body position from slipping or falling to the ground by an unintentional and uncontrollable incident, resulting in injury or no injury to the patient's body, including lying on the floor for an unexplained cause.

Fall Prevention Model in the Community refers to behaviors or actions of the elderly and their families as well as prevention methods with the community participation to reduce various risk factors affecting the occurrence of falls among the elderly.

Development of Fall Prevention Model refers to the development of procedures and approaches for preventing falls based on the community context on the community participation with evaluation process from the development of the studied model.

Community Participation refers to the process to carry out activities based on the rights and duties of the community to meet the common needs of the people in the community in the aspects of the way of life, values, traditions, and attitudes of the community members, resulting in an opportunity to cooperate, follow up evaluation, share the responsibility or share the benefits from that implementation (Cohen & Uphoff, 1980).

Fall Prevention Behavior refers to behaviors or actions to reduce risk factors affecting falls in the elderly both internal and external factors, including eye examination, exercise, changing posture slowly, getting enough sleep, and review of drug-related side effects as well as improving the environment to be safe, which can be assessed by the assessment form developed by the researcher from research documents and related research.

Balance refers to the ability to maintain the center of the body mass as the base of the body (Tinetti ME, Richman D, Powell L. 1990). Good balance is caused by the interaction between the nervous system and the brain and many systems, such as the eyes, inner ears, joints, and muscles, to determine the body's balance. In this study, balance ability was assessed from 1) a time up and go test, 2) a 30-second chair stand and 3) a 4-stage balance test.

4. Scopes of the Study

4.1 Area Scope

The research area included 20communities from 7provinces in Southern, Thailand, namely Nakhon Si Thammarat, Phatthalung, Surat Thani, Songkhla, Krabi, Trang and Chumpon. The study was conducted on falls among the elderly and the data were brought to representatives from 20 communities along with recruitment and selection of ready pilot communities. The study to develop a community-based fall prevention model for the elderly and the experimental use of the program developed jointly included Sa Kaew Sub-district, Tha Sala District, Nakhon Si Thammarat Province.

4.2 Content Scope

It includes:

1) To study on falls among the elderly in 20 southern communities in Thailand.

2) To develop a fall prevention model for the elderly in the pilot community by using a community-based research process by studying the community context and bringing data on falls among the elderly in the community to plan with network partners in the community and jointly developing the fall prevention model for the elderly and experimenting a multifactor fall prevention model for the elderly at home.

3) To evaluate and summarize the developed model, including learning lessons from the development of the model of the pilot community and the presentation of the fall prevention model for the elderly to 20 communities participating in the project to suggest and improve the fall prevention model to be appropriate to the context of the Southern community as a whole before implementation.

4.3 Implementation Period

The research was divided into 3 phases. The period was from May 2019 to March 2021. Due to the Covid-19 outbreak, the research was delayed, and it is necessary to stop at intervals. In the second phase, the program was used but had to stop visiting the area periodically and the

conclusion phase of the project with representatives of 20 communities must be conducted through a teleconference via Zoom.

4.4. Target Group Scope:

This research had target groups as follows:

4.4.1 Phase 1: Study the situation of falls among the elderly in the Southern community.

1) Data on falls among the elderly were obtained from the secondary data in the JHCIS on elderly health in 20 sub-district health promoting hospitals in 7 provinces in Southern, Thailand that participated in the project.

2) The administrators of Sub-district Health-Promoting Hospitals (SHPH), or the executives of Subdistrict Administrative Organizations (SAO who give information of the fall prevention measures in communities, and operational problems.

3) The informants in the pilot sub-district included the elderly leaders, public health workers, village health volunteer leaders (VHVs), community leaders, and representatives of the department of local administration.

4) The elderly in the pilot community

4.4.2 The Phase of the Development of the Fall Prevention Model

1) For the activity to prepare for the development of the community-based fall prevention model for the elderly, the participants included those involved in the elderly care in the pilot community in Sa Kaew subdistrict, Nakhon Si Thammarat, including nurses from 2 sub-district health promoting hospitals, Leaders of village health volunteers (VHV), village headmen, elderly Leaders, and local officials involved in elderly care, totaling 30 people.

2) The activity was to develop the potential of the village public health volunteers as a driving mechanism for preventing falls among the elderly in the community. Target groups included public health officers, nurse and VHV in the pilot community, totaling 20 people.

3) The study on the effectiveness of the home-based fall prevention program included the elderly in the pilot community who are at high-risk of falling and applied for the project, totaling 30 people.

4.4.3 Evaluation Phase and Project Closure

        1) The target group of the activity to take lessons learned in the pilot community included nurses from sub-district health-promoting hospitals, volunteer leaders, village heads, elderly leaders, and SAO officers involved in elderly care, totaling 50 people.

        2) A forum activity to present the results of the pilot community study was for representatives from 20 communities in 7 southern provinces to share opinions and improve the model to be appropriate to the context of the Southern community. The target groups included representatives from 20 communities, the model development working group in the pilot community, and experts on elderly care, totaling 40 people.

4.5. Expected Benefits

This research was participatory action research, resulting in the learning process, operations to find solutions by using a network of stakeholders in the community, and benefits as follows:

        1) To build a network for fall prevention for the elderly in the community.

        2) The elderly and their caregivers have enhanced knowledge and skills related to self-care to prevent falls and better fall preventive behaviors.

        3) Community leaders involved in elderly care in the community have been trained to analyze the problem and plan operations to prevent falls for the elderly in the community through the direct experience of working together with the research team in the area.

        4) Public and private sectors responsible for the promotion of elderly care can employ the findings as a guideline for further development and support for fall prevention model activities among the elderly in the community.

        5) The results of this study provided the fall prevention model for the elderly with community participation as a body of knowledge and a key tool for further application in other communities.

        6) The findings provided policy recommendations to apply the developed fall prevention model for the elderly in the community to the elderly healthcare service system in the local community.

Chapter 2. Literature Review and Related Studies

Chapter 2. Literature Review and Related Studies

A Study on the development of the fall prevention model in the southern community aimed to develop the fall prevention model with community participation. The researcher conducted a literature review and related studies as follows:

1. Falls in the Elderly

    1.1 Definitions of Falls in the Elderly

    1.2 Incidence of Falls in the Elderly

    1.3 Consequences of Falls in the Elderly

    1.4 Risk Factors for Falls in the Elderly

2. Falls Prevention Guidelines for the Elderly in the Community

3. Related Concepts and Theories

    3.1 Concepts of Participatory Action Research

    3.2 Concepts of Action Research Procedures

    3.3 Concepts of Models and Principles of Model Development

    3.4 Health Belief Model

4. Review of Related Studies

1. Falls among Elderly

1.1 Definitions of Falls in the Elderly

Falls can be defined in various ways. Defining the term fall as follow.

Worldwide Health Organization (2007) describes a fall as ''in-advertently coming to rest on the ground, floor or other lower level, excluding intentional change in position to rest in furniture, wall or other objects".

The Prevention of Fall Network Europe (Lamb, 2005) stated that a fall is an unexpected event in which the participant comes to rest on the ground, floor, or lower level.

Jitapunkul et al. (1998) defined fall in the elderly as occurring when the person loses their balance, causing them to hit the ground or other object at a lower level, for example, a desk, and excludes those resulting from overwhelming outside events, such as motor vehicle accidents or violence.

Feder et al. (2000) defined "falls as an accidental sudden fall in a position that causes a person to fall to a lower level, on an object, floor, or ground, rather than as a result of a sudden onset of paralysis, epilepsy, or overwhelming external forces."

Rubenstein et al. (1990) defined a fall as a sudden, involuntary body transfer to the ground at a lower level than the previous one.

The International Classification of Disease-9 (ICD-9) defined fall as one of the external causes of unintentional injury, coded E880-E888 in the ICD-9, and W00-W19 in ICD-10.

Fall can be classified as accidental, anticipated physio-logical fall, or unanticipated physiological fall (Janice Morse, 2008, pp. 9-11).

In summary, falls are an event that causes the elderly to become unstable on their balance or unintentional change in their position resulting in coming to rest or being hit on the ground, floor, or other objects at a lower level.

1.2 Incidence of Falls in the Elderly
1.2.1 Frequency of Falls

Globally, falls are a significant public health problem. One in three community-dwelling older people over the age of 65 falls annually, and this figure increases to one in two people over 80. An estimated 646 000 fatal falls occur each year, making it the second leading cause of unintentional injury death after road traffic injuries. Over 80% of fall-related fatalities occur in low- and middle-income countries, with regions of the Western Pacific and Southeast Asia accounting for 60% of these deaths.

Globally, the age-standardized incidence rate was 2,238 (95% uncertainty interval 1990 to 2532) per 100,000 in 2017, representing a decline of 3.7% (7.4 to 0.3) from 1990 to 2017, and equating to 171,691,220 (152,472,652–194,061,874) new injuries from falls in 2017. The age-standardized incidence rate decreased in the high-middle and high SDI quintiles and increased in the middle, low-middle, and low SDI quintiles.

Although fall rates worldwide vary widely based on the region, gender, and community-dwelling status, it is estimated that 28%-35% of people over 64 experience falls each year, which increases to 32%-42% when over 70 (WHO, 2008). In community-based studies among older

adults (≥ 60 years old) in Southeast Asia, the past-year fall prevalence lies in the range of 4.1%-29.0% (Yeong et al., 2016; Susilowati et al., 2020). In other Asian countries, such as Taiwan (17.2%) (Ku et al., 2013), India (36.8%) (Mane et al., 2014), and China (19.3%) (Wu& Ouyang, 2017). However, in Thailand, the prevalence of falls among community-dwelling older adults was 12.6%-26.1% (Knodel et al., 2015; Aekplakorn, 2016; Worapanwisit et al., 2018). In addition, many studies reported that the prevalence of falls was more significant among females than males. The overall ratio of female fallers to male fallers in Asian elders was 1.27-1.48 (Yu et al., 2009; Williams et al., 2015; Aekplakorn, 2016). While World Health Organization (WHO, 2018) reported that both genders are at risk of falls.

The Fifth National Health Examination Survey (Aekplakorn, 2016) study about falls in Thai elderly found that more falls occurred outdoor than indoors 64.6%), with 37.6% of the respondents reporting "slipping" and 39.9% said "tripping" as the circumstances for falling.

They discussed that public environments in Thailand (such as a path and streets) are inappropriately constructed, which can easily cause the elderly to fall. Consequently, the fall rate outdoor was higher. This finding somehow differs from Svensson et al. (1992) study, which showed a high proportion of falls occurring indoors. Indeed, recent studies on Chinese elders' falls and risk factors by Pi et al. (2015) showed that most (67.9%) fall occurred indoors. On average, the subjects who fell indoors were significantly older than those that fell outdoors. Approximately 42% of the falls occurred in the morning. Tripping was mainly caused by walking on air or the ground, whereas slipping resulted from walking on a wet floor. The bedroom was the most common location of the indoor falls, particularly for women. The most common area of indoor falls for men was in the living room.

In Thailand, about 1,000 elderly people passed away from falls, or an average of 3 people per day, and males had a mortality rate three times females. Based on fall injuries among the elderly in Thailand between 2016 to 2019, 141,895 elderly people who were injured due to falls received emergency medical services which was an increase of 29.5% from 2016. The group that received the most emergency medical services was people aged 60-64 years old, followed by people aged 65-69 years old, and people aged 70-74 years old, respectively. Additionally, most

of them were males rather than females while for older than 70 years old, females were more than males (Bureau of Epidemiology, 2017).

1.3 Consequences of Falls in the Elderly

Consequences of falls in the elderly Falls are a public health issue that mainly affects older adults and results in injury, hospitalization, premature death, and impaired mobility. Along with these factors, loss of independence, social isolation, and fear of falling also cost individuals, families, and public services. In addition, falls have physical consequences, which are immediate, like bruises or even more severe fractures. Secondary consequences are also caused by one being on the ground for an extended period; for example, one might be dehydrated. Finally, a consequence can be psychological, social, or economic consequences causing one´s quality of life to deteriorate drastically after a fall.

1.3.1 Physical Consequences

A fall causing minor to severe bodily injuries, such as bruises, sprains, lacerations, fractures, or concussions on the brain, may cripple and become fatal (Terroso et al.,2014; CDC, 2015). Recent studies have shown that older adults who fall must be treated in emergency departments at around 3 million per year, of which 800,000 elderlies were admitted due to head or hip fractures (CDC, 2019). The result is older people need surgery and extended hospital stays, which may cause the elderly to have complications such as complications in the digestive system; for example, abdominal pain may occur and intestinal immobilization after surgery or a urinary tract infection. In addition, the elderly may develop pressure ulcers from lying in bed for a long time, etc. In addition, the elderly aged 65 Years or more who fell and had a hip fracture have also been associated with higher co-morbidity and mortality rates. For example, one-year hip fracture mortality ranges from 18 to 33% (Roche et al.,2005).

1.3.2 Psychological Consequences

Many older persons have experienced psychological difficulties directly related to falls. The psychological trauma of a fall is also called 'post-fall syndrome, including fear of falling, loss of self-efficacy, activity avoidance, and loss of self-confidence. The result of the elderly losing

confidence as they don't want to go out to do outdoor activities due to fear of falling repeated, resulting in a continuous effect causing the elderly to become lonely from the lack of contact with outside society to the extreme, it may cause depression (Singh, & Misra,2009). According to fear of falling and fall-efficacy, anxiety refers to a temporary state of apprehension towards an explicit threat (in this case, the danger is a fall). The prevalence of FOF was higher in women than men and appeared to increase with age (Scheffer et al., 2008). Lavedán et al. (2018) found that the elderly with an experience of falls were more likely to report FOF 2.5 times than those who had not suffered any falls in the last year, especially women were more likely to be worried about falling than men four times.

1.3.3 Social Consequences

Falling in the elderly is associated with negative consequences on social issues, such as increased financial burden and disruption to a daily routine. They have revealed that older people have chosen to reduce their outdoor activities, which thus reduces their social relationships with friends or family. This problem may cause a person to cut down on their everyday activities. However, when a person is less active, they become weaker, increasing their chances of re-falling (Vellas et al., 1997). In the previous study on the financial burden after a fall in Thailand, the elderly with pelvic fractures from falls and hospitalization had an average expense of 2,427.2 dollars per person (about 72,810 baht) in the case of a general ward. In contrast, in the case of a particular ward, an expense increased to 3,739.1 dollars (about 112,170 baht) (Muangpaisan et al., 2015). In addition, the elderly and their families are also responsible for direct and indirect expenses. In addition, the government has lost much of the medical welfare budget.

1.3.4 Mortality

The World Health Organization (WHO,2008) reports that falls are the second leading cause of unintentional injury deaths worldwide among adults 60 and older, and age-adjusted fall mortality is increasing. Fall mortality in the older age group was consistent with increasing age caused by other factors associated with falls, such as 1) decreased activity; 2) chronic disease conditions such as arthritis, neurological diseases and urinary incontinence, 3) increased use of drugs which may enhance the effect on the central nervous system; and 4) age-related

degeneration of walking and balance (Burns, & Kakara, 2018). Even if a senior survives a fall and the subsequent medical care, longer recovery times translate to more extended hospitalizations and increase the likelihood of discharge to a senior rehab facility or a long-term care facility. These problems increase vulnerability to hospital-acquired infections, such as pneumonia, sepsis, and catheter-associated urinary tract infections. In addition, hip fractures often require surgical procedures involving sedation and further trauma, two things that can jeopardize an older person's life. Approximately 20% of hip fractures lead to death within six months. Over 80% of fall-related fatalities occur in low- and middle-income countries, with regions of the Western Pacific and Southeast Asia accounting for 60% of these deaths (WHO,2021).

1.4 Risk Factors for Falls in the Elderly

Factors affecting falls in the elderly are diverse and complex. Which may have only one or multiple risk factors That may increase the risk of falling. which can be categorized according to the following categories:

1.4.1 Biological Factors

The natural ageing process and the effects of acute and chronic health problems increase the risk that an older adult will fall or sustain other injuries. Parkinson's disease, arthritis, osteoporosis, heart disease, stroke, bowel bladder incontinence, and blood pressure are among the leading fall problems (WHO, 2008).

1) Osteoporosis is a disease in which bones become fragile. They fracture more quickly than normal bone. Even a minor bump or fall can cause a severe fracture. According to the National Osteoporosis Foundation, hip fractures are a frequent consequence of osteoporosis. Osteoporosis was once thought to be a women's disease, but nowadays, it strikes both men and women, though women are at a higher risk than men. Osteoporosis is also higher in Caucasians and Asians than in other racial and ethics groups. (National osteoporosis foundation 2004)

2) Urinary incontinence is a common condition in many older adults in their homes and institutions that causes significant morbidity and affects their quality of life. This problem leads to several functional difficulties and health conditions, affecting more women than men.

Psychological consequences of urinary incontinence include depressive symptoms, embarrassment, and anxiety. Socially urinary incontinence may lead to daily life, which will cause less or no interaction with friends and family. The physical consequences of urinary incontinence may lead to falls on slippery floors, or even one may fall rushing to the toilet.

3) Poor vision reduces postural stability and increases the risk of falls and fractures in older people. Central vision is seeing straight ahead and directly in front of you. Peripheral vision is the ability to see sideways or the surrounding outer area without turning your head to look (Miller, 2009). Poor vision increases the risk of falls. In particular, those people with reduced contrast sensitivity and depth perception were the main risk factors for falls.

4) Older people with multiple chronic illnesses are at greater risk of developing function-ing limitations and disabilities. For example, arthritis, dementia, and diabetes patients are at higher risk of falling than those without underlying conditions (Deandrea et al.,2010; Cuevas-Trisan, 2019).

5) Postprandial hypotension is probably due to an autonomic system dysfunction or the declining function of the cardiovascular system. It is described frequently in the elderly, with high-risk groups such as elderly patients with unexplained syncope. Risk groups are patients with autonomic dysfunction in diabetes mellitus, hypertension, Alzheimer's, and Parkinson's. However, PPH has been reported to occur in healthy individuals. Potential symptoms of a fall in blood pressure include dizziness, syncope, and falls (Van et al.,2010).

6) Neurological and brain disorders are caused by abnormal sensory perception of the nervous system and brain, Causing Alzheimer's, brain tissue atrophy, cerebrovascular disease, and Parkinson's disease-causing malfunction of the control system from the midbrain. In addition, older people with impaired coordination of organ function are caused by disorders of the nervous system and brain, causing loss of balance. (Bryant et al., 2005). These results of the condition increase risk of falls. (Deandrea et al.,2010).

7) Gait and balance disorders are common problems in older adults and a significant cause of falls. It has been associated with increased morbidity and mortality and reduced levels of function. Balance is the ability to collect sensory signals and proprioceptive related to a person's position and to create the appropriate motor responses to control body

movement (Sturnieks, 2008). Common causes of impaired gait and balance disorders include arthritis and orthostatic hypotension. However, there are usually multifactorial in origin and require a comprehensive assessment to determine contributing factors and targeted interventions. (Muchna et al.,2018).

8) Sarcopenia can be related to a food decline, prolonged hospital stays, and a long illness. Generally, the elderly has decreased mass volume and coordination, with phenotypic changes, such as selective loss of white fibers, changes in the skeletal system, and muscle endurance to continuous sub-maximum contraction. This will be decreased with increased age. Joint movement and response speed are reduced, affecting their walking posture, and causing the inability to lift their feet as high as they used to. Especially hip to bear the weight of the legs while walking, the elderly woman walks like a waddling gait, which causes tripping when walking on rough or uneven floors, easily leading to fall. The study of meta-analysis (Zhang et al., 2020) found that the elderly with sarcopenia syndrome have a risk of falls more than normal by 1.5 times (OR = 1.52, CI: 1.32–1.77).

9) Regarding depression, studies revealed that people with depression had a slower walking speed when performing tasks requiring total brain capacity and made more mistakes when performing two jobs simultaneously. This is consistent with a decreased ability of the analytical brain, resulting in an increased risk of falls. Besides, depression is also frequently related to brain diseases, such as stroke, Alzheimer's, and Parkinson's. This also increases the risk of falls (Deandrea et al., 2010). A systematic review of 17 studies found that people with depression had a 1.63 times higher risk of falls than those without depression (OR 1.63, 95% CI: 1.36 to 1.94, p<0.0001), and 14 studies found that people with depression had a 1.86 times higher risk of repeated falls than those without depression (OR 1.86, 95% CI: 1.45 to 2.38, p<0.0001) (Ambrose, Paul, & Hausdorff, 2013).

1.4.2 Behavioral Risk Factors

Behavioral risk factors for falling include the individual's actions, emotions, or choices. Behavioral characteristics are customarily associated with intention based on a research literature review. The most common behavioral risk factors are a history of falls, fear of falling, lack of

physical activity, inappropriate footwear, and clothing, and taking multiple medications, particularly psychoactive medications like tranquilizers or antidepressants.

1) A history of falls predisposes one to an increased risk of recurrent falls. Older people who fell in the previous year are more likely to fall again, mainly if they were hospitalized due to the fall. The risk group is defined as two or more falls, especially for people over 65 (Deandrea et al., 2010).

2) Lack of physical exercise is more likely to be associated with falls. Physical activity is any bodily movement that requires energy expenditure. It includes exercise (planned, structured and repetitive activity and aims to improve or maintain one or more components of physical fitness) and leisure or lifestyle activities (e.g., walking, gardening). In the broad fields of preventive strategies, an exercise is an essential approach that can help individuals to maintain or restore muscle strength, balance and posture control, bone mass, and performance of activities of daily life, and subsequently reduce the risk of falls and fall-related injuries (El-Khoury et al.,2013; Sherrington,2020)

3) Polypharmacy, several studies in aging populations have reported that using psychotropic drugs, antidepressants, and taking three or more other drugs is also a significant risk factor for falls (Woolcott et al., 2009; Richardson, Bennett, & Kenny, 2015; Morin et al., 2019; Zaninotto,2020). the consumption of fall risk-increasing drugs (FRID) (Zia, Kamaruzzaman, & Tan, 2017). There are many consequences, including drug reactions, drug interactions, and geriatric syndromes, such as falls, cognitive impairments, and urinary incontinence. In addition, sedative drugs, antidepressants, and antipsychotic drugs contribute to many falls due to their side effects.

4) Daily routine behavior in a hurry and lack of concentration or doing multiple activities simultaneously increases the risk of slipping and falling quickly.

5) Footwear has also been a risk factor that contributes to some falls. Walking indoors barefoot or with socks that are not suitable or even walking outdoors with poorly fitted shoes have led to foot problems, increasing falls among the elderly. A shoe's sole material and the tread design can affect one when walking; the sole thickness can be a problem too.

6) Fear of falling is characterized by anxiety related to walking or concern about falling as a psychological consequence which a previous fall. However, it can also occur without

a history of falls and may be associated with poor balance ability. A previous study conducted in Taiwan (Chang et al., 2016) investigating the incidence, characteristics, and risk factors for fear of falling among 3,284 community-dwelling people aged 65 years and above, indicated more than half of the participants reported fear of falling. The study concluded that history of falls, female gender, low perceived health, insomnia, and depression was correlated to fear of falling. Interestingly, Kwan and colleagues (2011) identified that fear of falling was a significant risk factor for falls, with odds ratios ranging from 1.9 to 3 in six fall studies among Chinese populations.

7) Social determinates are as crucial as any other risk factor for falling. Related factors include people with low income, low education, inadequate housing, and those who lack support networks and inappropriate social services; health is generally at high risk for chronic health problems that are considered a risk factor for falls. Conversely, lower socioeconomic status tends to be negatively associated with better well-being.

1.4.3 Social and Economic Risk Factors

Social determinates are as crucial as any other risk factor for falling. Related factors include people with low income, low education, inadequate housing, and those who lack support networks and inappropriate social services. Generally, they are at high risk for chronic health problems considered risk factors for falls. Conversely, lower socioeconomic status tends to be negatively associated with better well-being. A previous study on social Determinants of falls among older adults found that the social relationship index reduced the risk of falls. Moreover, having good friends in the neighborhood reduced the association between depression and falls.

1.4.4 Environmental Risk Factors

Home hazards as the built environmental factor have been recognized as contributing to falls in older adults. Adjusting the home environment to prevent or reduce the number of falls is likely to be reasonable for everyone using the safer environment. A previous study has shown that inactive older people are at high risk for indoor falls, and relatively active, healthy people are at increased risk for outdoor falls (Kelsey et al., 2010). For households in the Thai style, Sophonratanapokin and colleague (2012) explained that Thai houses contain environmental hazards such as clutter, inadequate lighting, especially on stairs, obstacles on the way, door sills,

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slippery floors, electric cords, rugs, unstable furniture, and other tripping hazards. Lack of essential aids such as grab rails, grab bars in the bathtub, lack of bed rails, and the beds being too high are some of the causes of falls among the aged. Therefore, home improvement efficiency is crucial for weak Thai older adults at home.

2. Fall Prevention for the Elderly Guideline
2.1 World Health Organization

Since falls in the elderly occur by many causes, which may be one or multi causes supporting each other along with many risk factors in each cause, falls are classified as one of the geriatric syndromes, which is an atypical presentation. Therefore, fall prevention for the elderly is complicated to implement. Based on such problems, the World Health Organization (WHO, 2008) has proposed the active aging fall prevention model, which consists of three components as follows:

Pillar one - Building awareness of the importance of fall prevention and treatment among older people. Campaigns need to raise general awareness and should not be aimed only at older people. The opinions of others, including health professionals and family, influence older people's decisions.

Pillar two - Assessing risk factors for falls at the individual, environmental and societal factors and improving the identification and assessment of risk factors and determinants of falls including individual, environmental, and societal factors.

Pillar three – Having contextual design and management in each community for fall prevention and identifying and implementing a realistic and effective intervention. The design and implementation of culturally appropriated evidence-based interventions will significantly reduce the number of falls among older persons.

2.2 The Prevention of Falls Network for Dissemination (ProFouND)

The ProFouND has supported the policy to build awareness of fall prevention among the elderly and those involved in the community by creating a positive attitude towards fall prevention among the elderly as the first step. Based on studies in the country and abroad,

awareness and a positive attitude toward preventing falls among the elderly and families are essential factors in the sustainable implementation of preventing falls in the community (Clemson et al., 2004; Schepens, Panzer, & Goldberg, 2011; Boongird et al., 2015). The aim of building awareness must be motivated to adjust self-care attitudes to prevent falls. It should emphasize promoting physical and psychological health to slow down aging and generate freedom in self-help. Strategies for positive attitudes and building awareness include communication through books, videos, and campaigns in various media in the community and building a team in the community to help campaign for ongoing activities (Boongird et al., 2015). The target groups of awareness building on fall prevention are as follows:

1) Elderly: Most people think that falls are caused by inevitable ageing. Therefore, the elderly should be most aware of it to avoid and protect themselves from falls.

2) Caregivers and Family Members: The awareness to identify and reduce risk factors of falls.

3) People in the Community: Since many fall risk factors occur in adulthood, it should be aware of reducing risk factors in the future and aiming for cooperation in preventing falls for the elderly at home and in the community.

4) Local Organization: Since local administrative organizations play a crucial role in caring for the quality of life of the elderly in the community, they should build awareness to make the environment safe against falls and organize various activities for continuous fall prevention.

5) Health Organization: Medical practice guidelines for fall prevention for the elderly have recommended providing a training course for health personnel at all levels to create a positive attitude towards the problem of falls, knowledge, and skills in risk factor screening, and providing care to reduce risk factors.

6) Public Sector: This is to build awareness for government officials at all levels on the problem, good results, and worthiness in support of the fall prevention policy to reduce the problem of dependency among the elderly.

7) Mass Media: It should be disseminated to society to create a positive attitude toward health promotion for the elderly and provide knowledge in preventing falls.

2.3 Fall Risk Assessment for Individual, Environmental and Societal Factors

Today, guidelines developed by health organizations in the United States, including the American Geriatrics Society and British Geriatrics Society (2011) and the Center for Disease Control and Prevention (2008), recommend screening to find fall risk factors. The guidelines are consistent with fall risk assessment guidelines in Thailand (Institute of Medicine, Department of Medicine, 2019), such as history taking, physical examination, and environmental assessment surveys as follows:

2.3.1 Falls History Taking

For history taking of falls, the American Geriatrics Society and British Geriatrics Society (2011) recommended that if the elderly have a history of falls within the past year or suffered a fall injury, it should be considered risky. Suppose the elderly have feelings of insecurity or difficulties walking or have a risk self-assessment of more than or equal to 4 items; the elderly is also at risk of falling. The elderly must be assessed for their physical fitness for risk assessment. In case of falls, it should be assessed in detail, namely 1) the activity or posture at the time of the incident, 2) the place of incident and nature of the environment, 3) the time of the incident, 4) the relationship to the previous event, 5) consequent or immediate symptoms by falls, 6) the number of falls, and 7) other diseases or health problems.

2.3.2 Physical Examination

1) Vital signs include checking the pulse and blood pressure to assess postural hypotension. Blood pressure was measured in the lying position after 5 minutes and in the sitting position after 1 minute. A decrease in systolic pressure by 20 mmHg and/or drop in diastolic pressure by 10 mmHg or a reduction in mean arterial pressure by 20 mmHg is considered postural hypotension.

2) Physical fitness test: Most studies employed a Timed Up and Go test as a fall risk screening tool. Furthermore, other physical fitness tests for additional screenings include the Berg Balance Scale (30-second chair stand) and (4 stage balance test) (Phelan et al., 2015).

2.3. Multifactorial Fall Risk Assessment

Previous studies confirmed measures to reduce the risk of many factors, which prioritize assessing risk factors before risk factor correction or management (Gillespie et al., 2012). Therefore, this form aims to determine the factors related to all falls and lead to advice for modification or handover to deal with that risk factor. In addition, the past assessment guidelines determined differences and similarities of the assessment, which can be summarized based on the following factors:

1) Regarding age and gender, the risk was divided based on age range. People aged under 65 years old are low risk. People aged 65-75 years old are medium risk, and people aged above 75 years old are high risk. For gender, females were at higher risk than males.

2) Fall history was a factor in the risk assessment among the elderly in all previous studies. There was a history-taking of falls in the past 6 months and 12 months. Most studies employed a fall history of 1 time in the past 12 months as a criterion to diagnose the risk of falls.

3) Regarding anxiety and fear of falls, the assessment of the fear of falls was another factor found in the elderly who had a fall history before. Most questions are about falls or feelings of reluctance to do activities due to fear of falls. If the elderly has such concerns, they are at risk of falls. The Thai Short Falls Efficacy Scale-International (Thai Short FES-I) is currently used with 16 questions about concerns of falls during activities in daily life. Then, the Thai Short Falls Efficacy Scale-International with 7 questions was developed to be used with the elderly in the community with the IOC, Cronbach's alpha coefficient of .92, and intraclass coefficient of .83. It was translated into Thai and used with 330 elderly Thai people in the community, and it was found that Cronbach's alpha coefficient was .91 (Phongphanngam & Lach, 2019).

4) Regarding impaired mobility assessment, the movements most associated with falls include gait and balance, which can be assessed by observing whether gait is abnormal or not with the following related physical fitness tests:

4.1) The Timed Up and Go test is commonly used to assess balance and gait to screen and assess the risk of falls. From previous studies, this test was associated with falls in the elderly. The elderly was required to sit in a chair, get up, walk back and forth for 3 meters and return to the same seat. The time was counted the moment a participant got up from the chair

and stopped when the bottom touched a chair. The criteria used to classify the fall risk group was a person who took the test time greater than or equal to 13.5 seconds which was considered at risk of falling. However, in Thailand, interpretation criteria are employed. So, on average, people aged 65-85 take no more than 12 seconds, and those who spend more than 14 seconds have a higher chance of falls (Institute of Geriatric Medicine, Department of Medicine Services, 2019).

4.2) A chair stand test is commonly used to assess the lower body strength required for various activities, such as using stairs, walking, getting out of a chair, and balancing. The 30-second chair stand was assessed by sitting up consecutively within 30 seconds and counting the times. The criteria are specified based on age and gender (Rikli & Jones, 1999) from 8 to 14 times. If less than 8 times, the leg muscles are not strong, predicting risk of limited ability to walk on a flat surface, use stairs, get out of bed or chair, and get in and out of a car. Also, there was a risk of falling.

4.3) There are 4 types of 4 stage balance tests, including side-by-side stand, complete tandem stand, semi tandem stand, and one leg stand, where if unable to stand or to stand for less than 10 seconds, they are considered to have balance problems and are at risk of falls (Phelan et al., 2015).

5) Medication review is a significant risk factor assessment across all studies. First, there considers the number of medicine types and medicine groups used. For example, suppose the elderly take more than or equal to 4 types or take one psychoactive medicine or others that cause drowsiness or postural hypotension; they are at risk of falls. Yet, most studies considered both conditions (Woolcott et al.,2009; Tiedemann et al., 2010; Ming et al., 2021).

6) Postural hypotension is a common problem among the elderly associated with falls. The assessment is in the form of questions about feeling dizzy when changing posture. The elderly must lie down for 5 minutes and stand upright. Blood pressure is measured while lying and standing in minutes 1 and 3. If the elderly feels dizzy or have a different systolic blood pressure of 20 mmHg and diastolic blood pressure of 10 mmHg. In that case, they are considered postural hypotension with a risk of falls.

7) Cognitive function related to intelligence and memory is assessed by the Mini-Mental State Examination (MMSE). In Thailand, it is evaluated by using the Mental State

Examination Thai version-2002. The scores indicating cognitive impairment are those being less than the cut-off points determined by Aekplakorn (2014), which are: 14 out of 23 points for illiterate, 17 out of 30 points for primary school levels, and 22 out of 30 points for higher levels.

8) Eye examination and visual acuity are vital factors that should be assessed every year. The elderly with visual impairment can read characters on 6/12 lines of the Snellen chart less than half of all characters, have visual acuity less than 20/40, or wear multi-lens glasses, which indicates visual problems and are at risk of falls (Phelan et al., 2015).

9) Regarding foot and shoe characteristics and using walking aids, foot and abnormal walking assessments include flat feet, deformed feet, abnormal toes, wounds, etc. In addition, inappropriate shoes, such as too tight shoes, high-heels, or walking barefoot and using any type of walking aid are considered risks of falls.

10) Environmental assessment for the elderly is to keep the elderly safe and prevent falls for long-term quality of life according to the guidelines for a safe environment and housing for the elderly in Thailand (Trairat Jarutat et al., 2005) with the following conditions:

10.1) A bathroom or toilet should not be far from the bedroom since the elderly are very old, often having urinary incontinence problems, and it can be inconvenient for a far bathroom or a potty in the bedroom at night. It should not be too wide or too narrow with enough light for visuality and handrails from the bedroom to the bathroom and inside the toilet. The bathroom floor should be the same level as the exterior. The material must be a non-slip surface and easy to clean with a good drainage system or separation between dry and wet sections. The toilet should be installed in a flat position because the elderly will find it difficult to squat and often have joint stiffness and pain.

10.2) The bedroom for the elderly should be on the ground floor and placed in an easily accessible location. The height of the bed should be at the level where the elderly sits and can put feet on the floor perpendicularly. The mattress should not be soft or too stiff, with a handrail for support when getting up from the bed and a bedside table for necessary items for easy reach and enough light in the room.

10.3) For safe stairs, the surface is made of non-slip material with a width of not less than 90 cm. A stair riser should have a height of less than 15 cm, while a stair's builder

truss of less than 28 cm wide. The back of the stairs must be completely closed since the elderly tend to walk hunchbacked and knees and hips slightly bent. When walking, the feet are level with the ground with a short stride. If each step is high, climbing the stairs won't be easy. If there is a terrace at the stairs, it should have a width of more than 1.2 meters. The edge of each stair step should be equipped with non-slip material with a color that differs from the stair. Handrails should be spherical on both sides for easy grip with a colored bar or symbol indicating the top or the bottom position. Handrails should be about 30 cm longer than the stairs to prevent falls in the case of wrong steps, along with enough light and no obstacles on the stairs.

11)   For other related factors and specific risk factors, there were many variations in each study, including depression, alcohol drinking, physical activity level, etc.

2.3.4 A Review of the Fall Risk Assessment for the Elderly in the Community

In primary care settings in Thailand, the Ministry of Public Health has an annual fall assessment guideline for the elderly by asking about their fall history in the past year and using the Timed Up and Go test (Committee for the Development of Health Screening and Assessment Tools for the Elderly, 2021). Moreover, the fall risk among the Thai elderly in the community was assessed by the Thai Fall Risk Assessment Tool (Thai FRAT), which is a tool for evaluating the risk of falls among the elderly developed by Ladda Thiamwong et al. (Thiamwong et al.,2008). The issues in the assessment of the elderly at risk consisted of:

1) female for 1 score

2) visual impairment, which is unable to read the numbers at 6/12 of the Snellen chart more than half for 1 score

3) balance impairment which is unable to stand with feet straightforwardly or stand for less than 10 seconds for 2 scores

4) use of medicines of more than one type, including sleeping pills, tranquillizers, antihypertensive drugs, diuretics or taking 4 or more types for 1 score

5) having a fall history or 2 or more falls in the past six months for 5 scores

6) living in a Thai-style house, which is a house with a high platform of 1.5 meters for 1 score

The scores totaling 11 scores; if the score is 4 or more, a subject is considered at risk of falls. For the sensitivity and specificity of this tool, compared to other tools used to assess fall risk among the elderly, the sensitivity and specificity were found to be high levels of 0.92 and 0.83, respectively. If the score is 4 or more, a subject is considered at risk of falls. For the sensitivity and specificity of this tool, compared to other tools used to assess fall risk among the elderly, the sensitivity and specificity were found to be high levels of 0.92 and 0.83, respectively.

The study "Evaluation of Clinical Practice Guidelines on Fall Prevention and Management for Older Adults" (Montero-Odasso et al., 2021) is a global study of the 15 high-quality fall prevention guidelines for the elderly worldwide. This study found that screening for the elderly's fall risk consisted of two steps: 1) fall history screening, demographic factors (e.g., elderly or female) or clinical abnormalities (gait and balance disorders), and 2) balance and gait assessment. Therefore, the following tools are recommended from 13 of 15 guidelines, including the Timed Up and Go Test (TUG), Berg Balance Scale, and Tinetti Performance-Oriented Mobility Assessment Tool. In addition, the TUG is mostly recommended from 6 of 15 guidelines.

2.4 Appropriate Design and Management to the Community Context for Fall Prevention among the Elderly

The study "Evaluation of Clinical Practice Guidelines on Fall Prevention and Management for Older Adults" (Montero-Odasso et al., 2021) is a global study of the 15 high-quality fall prevention guidelines for the elderly worldwide. This study found that screening for the elderly's fall risk consisted of two steps: 1) fall history screening, demographic factors (e.g., elderly or female) or clinical abnormalities (gait and balance disorders), and 2) balance and gait assessment. Therefore, the following tools are recommended from 13 of 15 guidelines, including the Timed Up and Go Test (TUG), Berg Balance Scale, and Tinetti Performance-Oriented Mobility Assessment Tool. In addition, the TUG is mostly recommended from 6 of 15 guidelines.

2.4.1 Intervention Model for the Fall Prevention among the Elderly in the Community

Based on the study by Gillespie (2012), interventions for fall prevention for the elderly can be conducted in 3 types as follows:

1) A single domain is for fall prevention by taking a specific action to prevent falls among the elderly, such as exercise to prevent falls, environmental management, or home hazard management.

2) The multiple domains are to organize activities or programs to prevent falls among the elderly. Most programs are conducted in research with clearly defined activities under the same model, such as the home and the environmental assessment with exercise activities on knowledge to prevent falls.

3) The multifactorial domain refers to fall prevention with various activities. Still, interventions are different for each person, which requires an individual assessment of fall risk factors to provide assistance or appropriate correction of risk factors in a specific case.

2.4.2 Fall prevention among community dwelling older adults
2.4.2.1 Exercise to prevent falls

According to a systematic review, the most common fall prevention exercise programs include exercises that consist of gait training, balance training, and functional training (Guirguis-Blake, 2018; Sherrington et al., 2019). It was found that the incidence of falls among the elderly with statistical significance. However, Gillespie et al. (2012) found that only one exercise could not reduce the risk of falls or the number of elderlies who had statistically significant falls. When compared to usual care, a study by Thunyarat Anothasintawee et al. (2014) found that the most effective exercise reduced the risk of falls. The exercise enhances the strength of gait and balance, such as the Otago exercise program and a 3-plane form of exercises, such as Tai Chi, Qi Gong, dancing, and aerobic dance of nine squares which have different difficulties and complexity. This is consistent with the American and British Geriatrics Society (2011), recommending safe and practical exercises such as training balance, muscle strength, and gait as beneficial guidelines.

1) Stretching exercise for muscle strength and balance

There are activities for strengthening flexibility muscles and body balance. The movements are divided into two levels: 16 easy movements and 18 difficult ones (Campbell & Robertson, 2003). The elderly must undergo a preliminary assessment of vital signs before exercising based on each individual's physical condition. From a systematic review to examine the effects of exercise on fall prevention among the elderly in the community (Sherrington et

al.,2019), there were 108 RCT studies with 23,407 participants and found that the exercises that mostly prevent fall in the community included gait training, balance training. In addition, balance, and functional exercises (39 studies, 7,920 participants) reduced the rate of falls by 24% (RaR 0.76, 95% CI 0.70 to 0.81). A systematic review in 7 RCT (Thomas, Mackintosh, & Halbert, 2010) found that the Otago exercise program, after 12 months of continuous training, could significantly reduce the rate of falls; (incidence rate ratio = 0.68, 95% CI = 0.56-0.79), and the risk of mortality from falls with significance (risk ratio = 0.45, 95% confidence interval (CI) = 0.25-0.80).

   2) Tai Chi is a form of exercise recommended by the Centers for Disease Control and Prevention that focuses on breath management and meditation. Tai Chi practitioners require a low movement speed but continuity and stability so that the body uses energy equivalent to moderate aerobic exercise, resulting in fibers and muscle development, personality, posture, and balance enhancement. A study on the effect of Tai Chi exercise on the balance of the elderly found that the elderly who performed Tai Chi practice had better balance. For 18 systematic review and meta-analysis studies in RCT (Huang et al., 2017) involving 3,824 participants on the effects of Tai Chi exercise on the chance of falls and incidence of falls, the Tai Chi exercise group significantly reduced the risk of falls (RR 0.80, 95% CI 0.72-0.88) and incidence of falls (IRR 0.69, 95% CI 0.60-0.80) more than the control group along with the increased protective effect based on the frequency of exercise.

   3) Exercise by dancing is an exercise with the body's movement in different directions and music. Rhythm dance improves balance since it is a low-impact aerobic exercise suitable for the elderly. It also promotes physical, psychological, societal, and spiritual health. From a systematic review and meta-analysis of 29 randomized clinical trials among more than 4,200 healthy participants aged 65 years old, people who participated in "rhythmic movement activities in different moves along with social interactions" compared to the same age group, those who performed dance-style exercises reduce risk of falls by 37% from 8 out of 29 trials and 31% in 7 trials (Mattle et al., 2020).

   4) Frequency in exercise: Highly effective training among the elderly must be continuous. To the literature review, for weekly exercise frequency and duration, the activity should be performed minimum twice a week, and the time of each program must not be less

than 25 weeks (Sherrington et al., 2019). Exercising more than 3 hours a week could reduce the incidence of falls by 23% (Gillespie et al., 2012). The American Geriatrics Society and British Geriatrics Society (2011) recommended strategies to help the elderly exercise by reinforcement, visits for encouragement, and advice for exercise goals to prevent falls in the elderly. This includes those without a fall history and with a risk of falls. Moreover, exercise should be based on the health condition of the elderly (WHO, 2020).

2.4.2.2 Medication Review Program

Medication review aims to reduce the use of medicines that trigger the incidence of falls, identify the types of medicine, and reduce the dose of medication that may have side effects, such as medicines that cause fainting or drowsiness, since these can increase the risk of falls. Moreover, most elderly might not be aware of the side effects of drugs, especially those taken regularly, since the absorption mechanism of the medicine and toxic cleansing may affect the side effects of the medicines they take. In addition, the elderly may take multiple drugs simultaneously, each of which may interact with each other, resulting in a chance of falls. A systematic review and meta-analysis of 14 randomized controlled studies (Ming et al., 2021) found that all medication review interventions were both a single program or a part of the multifactorial fall prevention program. There was significant effectiveness in fall prevention for the elderly in the community.

Centers for Disease Control and Prevention (2011) has recommended guidelines on medication review for the elderly as follows:

(1) Medication review should be conducted on all elderly receiving four medicines or more and psychoactive medications.

(2) Medication review should be conducted in hospitals, health check-up service units, and home visits. The operators should be health care providers, such as registered nurses, pharmacists, and physicians.

(3) Medication review in the elderly in terms of changing medications, reducing doses, or refraining from medicines needs the consideration of the elderly or the main responsible caregiver as well.

（4）Medication review should cover an assessment of the need for vitamin D, calcium, and vitamin supplements used in the treatment of osteoporosis.

（5）Alcohol consumption should be assessed during medication review of the elderly.

(6) Accompanying symptoms should be assessed after using the medication, such as drowsiness and dizziness when changing from lying to sitting or standing together with blood pressure measurement to assess postural hypotension.

2.4.2.3 Environmental modification Programs

To improve the environment inside and outside the home: Environmental factors are important factors that cause falls among the elderly, especially in the home environment. For example, falls can be caused by slipping, tripping, insufficient lighting, and the absence of railings in the bathroom, handrails, and ramps. Therefore, all elderly who has suffered injuries from falls should be assessed for safety inside and outside the home. In addition, during the home modification, they should also provide suggestions for the elderly since they may not be familiar with the devices installed. This program can reduce the risk of falls among the elderly. A systematic review by Gillespie et al. (2012) found that home improvements for safety resulted in a reduction in the elderly fall incidence by 0.8 times (0.81, 95% CI0.68-0.97; I2 =64 %) but did not significantly reduce the incidence of bone fractures from falls, statistically compared to routine care.

2.4.2.4 Multifactorial program

Since risk factors that cause falls among the elderly are caused by many factors, guidelines or activities are developed to prevent falls among the elderly, covering all risk factors, known as a multifactorial fall prevention program. For example, the Centers for Disease Control and Prevention (2011) recommended education, exercise promotion, medication review, visual assessment, home safety assessment, and home environment modification. In addition, based on a literature review of the effectiveness of the multifactorial program for reducing the incidence of falls among the elderly in the community, Gillespie et al. (2012) studied 19 RCTs with 9,503 populations. This study found that falls in older adults decreased after participating in

multifactorial programs. The overall effect is RR 0.76, 95% CI 0.67–0.86: I^2 =85%, p < 0.0001. Moreover, a systematic review of 26 RCTs on individual multifactorial fall prevention programs (Guirguis-Blake et al., 2018). The effects of this study found that the multifactorial program had the following models:

1) Assessment of risk factors for falls includes balance, gait, visuality, cardiovascular system, blood pressure, medications, environment, risk behaviors in daily life, cognition, and mental health.

2) Interventions vary, including individual and group exercises with and without a facilitator, modification of risk behaviors in daily life, nutrition therapy, education through various media, namely instructive videos, lectures, and brochures, medication management, urinary incontinence management, environmental improvement, and referral to a professional multidisciplinary team. The results of 26 studies found that the incidence of falls decreased (IRR 0.79, 95% CI: 0.68 - 0.91), but it was not related to a reduction in injuries or mortality caused by falls.

2.4.2.5 Other measures to prevent falls in the elderly

1) Anti-slip shoe device

A study by Gillespie et al. (2012) found that wearing anti-slip footwear could significantly reduce the incidence of falls in the elderly compared to those wearing regular footwear (pooled RR = 0.42, 95% CI: 0.22-0.78).

2) Cognitive behavioral therapy

A study by Gillespie et al. (2012) found that cognitive-behavioral therapy could not significantly reduce the number of elderlies who fell (pooled RR = 1.11, 95% CI 0.8-1.54) and the incidence of falls (pooled RR = 1.11). 1.00, 95% CI: 0.37-2.72).

3) Visual acuity assessment with or without intervention

The systematic review study found that it could not reduce the number of the elderly who fell, the incidence of falls, and the incidence of bone fractures caused by falls compared to routine care (Gillespie et al.,2012).

4) Vitamin D supplementation in the elderly

In a systematic review of 62 RCTs, totaling 35,058 populations (Guirguis-Blake et al., 2018), vitamin D supplementation could not reduce falls among the elderly. Furthermore, a meta-analysis study also found that vitamin D supplementation alone or with calcium could not reduce the incidence of falls among the elderly (Dawson-Hughes et al., 2010). Therefore, when taking vitamin D or calcium supplements, some elderly should be cautioned, especially those with kidney stones, kidney disease, and high blood calcium levels.

5) Applications and communication technology for fall prevention

Nowadays, many technological innovations are developed for fall prevention, such as sensor shoes (Hamm et al., 2016), wristbands, or waist belts for the elderly (Ahmed et al., 2017). In Thailand, innovation has been developed to detect falls among the elderly by tracking by sending alerts via mobile phones. This is in the process of improvement for practical use, such as creating a fall alert system in a bathroom (Saranan, & Chaiyabut, 2020). For checking the entry and exit of the toilet and detecting falls inside the toilet, it was found that accuracy was 98% by having alerts through the Line application every 10 seconds until a victim was rescued from the bathroom. A mobile application was also developed that promptly asks for help as specified by the user. Additionally, for a fall detection kit (Mahasak Ketcham, Panya Makasorn, and Wandee Sanyavivat, 2013), a sensor is installed on the waist of the elderly, and the alert will sound when the elderly fall.

3. Related Concepts and Theories
3.1 Participation Theory
3.1.1 Definition of participation:

Meaning of participation, expert academics, have researched and composed textbooks on this subject for a long-time defined participation. The details are as follows:

Arnstien (1969) Participation means participation without any role. Inevitably it will not result in that quality participation. Participants must be able to exercise power and control to be effective.

Berkley (1975) Involvement means that leaders allow all their followers to participate in work decision-making as possible.

William Erwin (1976) Participation refers to the process by which people are involved in implementing development, sharing ideas, making decisions, and solving their problems.

Cohen & Uphoff (1981) Participation means community members are involved in four dimensions: 1) participation in decision-making on what to do and how; 2) participation in sacrifice in development. 3) Participation in sharing benefits arising from operations 4) Participation in project evaluation.

United Nations (1981) Participation refers to people᾽s active and energetic involvement in decision-making to set social goals and resource allocation to achieve them and follow plans or projects willingly

Putti (1987) Participation is the basis of activities. That will result in broader management. The participation process can allow participants to expand to the lower level of the organization.

In summary, participation enables people from all sectors to cooperate in decision-making. They are carrying out activities monitoring and independent assessments. Equally applies the results to improve and develop work to develop or use creativity and individual expertise in solving community problems and creating more transparent and efficient group work.

3.1.2 Participatory process

When it comes to the process of public participation must think of a process that will allow people to play a role in every step of involvement. At the very least, the public must be aware of the various procedures, whether the decision-making process, operation procedure and procedures for evaluation, to be aware of the possibility of various public activities affecting the people directly and indirectly. The concept of the participatory process that many views. However, if compiled into a systematic manner according to the concept of Cohen, J.M., & Uphoff, N.T. (1980) took the participatory process from many academics and compiled it into the main idea, and classified the participatory process model as follows:

Step 1 Participation in the decision-making process. The first thing to do is to define needs and prioritize. Subsequently, the policies and people involved were chosen. This decision

is an ongoing process that must be carried out repeatedly from the initial decision-making during planning and decision-making during the implementation of the plan.

Step 2 Participation operations, as a component of project implementation, are based on the question of who can benefit the project and how—for example, resource assistance, administration, and coordination, including asking for help etc.

Step 3 Participation in receiving benefits. In addition to considering the importance of quantitative and qualitative benefits. However, we must also consider the distribution of benefits within the group. The project's benefits include both positive benefits and negative consequences of the project. Consequently, the contribution to be gained will be both beneficial and harmful to individuals and society.

Step 4 Participation in Evaluation It is important to note that views, preferences, and expectations which can influence the behavior of individuals in different groups.

In summary, in the process of participating in this research, the researcher will focus on the process of participating in the issue of assessing the cause and needs, planning and execution, involvement in decision-making, operation, evaluation, and public relations.

3.1.3 Participation Types in Communities

Cornwall (2008) concluded that the participation of the community It can be divided into 3 types:

1) Marginal Participation is participation arising from unequal power relations; one side feels inferior. For example, the other party have insufficient resources or knowledge, etc.

2) Partial Participation is the participation that arises from the formulation of government policies without knowing the needs of the people. Therefore, participation is only an opinion in the implementation of specific activities.

3) Full Participation is participation in all stages of development with equality. It is considered actual participation in the development of the people according to the concept and principles of community development. It supports and encourages effective community collaborative learning strategies when used in the learning process.

Phisut (2004) studied the community and participation in educational management. As a result, it can be concluded that the involvement of the community can be divided into 2 types:

1) The nature of participation from the rational relevance by giving opportunities to society and organizations in the community. People have prominent roles according to their rights, duty to take part in the operation from the initiation decision-making, planning, cooperation, and accountability for impacts as well as to promote, induce and support the process to benefit the community according to the voluntary objectives set forth.

2) Characteristics of participation from psychological involvement. It is the community participation in which the mental, emotional, as well as people values guide themselves to participate and show creativity. Actions to achieve the stated objectives make those who participate bond and have a sense of responsibility for voluntary activities.

Mettkarunchit (2010) discussed the types of participation which participation can be classified into two types as follows:

1) direct involvement Participation in management is essentially decision-making. Therefore, those directly responsible for the activities, such as executives, project leaders, etc. It often allows other people to participate in the form of an advisory committee who gives their opinions and suggestions because some activities may have obstacles, not able to solve the problem to be successful. Therefore, allowing other people to participate in the decision-making. As a result, the decisions are acceptable to the public or to produce effective results. Direct participation is therefore essential; it is a formal joint and is often written, such as an appointment order, invitation letter, meeting minutes, etc.

2) Indirect participation is the informal way of accomplishing a particular activity without participating in decision-making in the administrative process, but it's about support. Promote only to achieve goals such as donating money, property, materials, labor, helping to contribute, not attending the meeting but being willing to cooperate, etc.

3.1.4 The nature of participation

The nature of participation can be considered a variety. It depends on whether you are interested in studying the issue. An interesting point in this research is the emphasis on the nature

of participation in problems arising from activities such as participation in public interest opinions. Participation in decision-making, planning and co-examination as a community organization, etc., and emphasizing the study of administrative aspects arising from policy and practical implementation by government officials and the community. As some scholars have commented, for example:

Huntington & Nelson (1975) commented that the nature of public participation is determined by activities and administration, which must be studied simultaneously at that activity level. It will be the foundation of making people can participate as much as possible. As for the management, it will be the nature of the authority that will allow people to have the chance to express their opinions or describe participation in activities by Huntington & Nelson. The principles for considering the nature of the involvement are as follows:

1) Activity Level: this type of participation is determined by the activity involved; for example, politics may be based on public participation in elections. Referendums, protests, if the state has a project that affects the people.

2) Management level: the structure of an organization must have a chain of command.

- Horizontally, all departments and parties are equal in position, so their participation in the horizontal is loose, perhaps because they are similar in status or function.

- Vertically, it is the participation in the chain of command, such as having a subordinate, having divisions, departments descending order, etc. The work must be checked in a hierarchy. A supervisor will review exploitation for self or others.
-Horizontal and vertical participation sometimes must work with supervisors and colleagues in other departments. Therefore, they must perform roles according to the state of the horizontal and vertical.

Wattanasiritham and Petmark (2008) discussed the nature of participation in community development in the teaching materials on people's involvement in urban and rural development. In conclusion, the nature of participation can be divided into six types as follows:

1) Awareness of information of stakeholders and relevant persons or entities to inform the project details and the expected impact. However, such information must be notified before deciding to implement the project.

2) Public consultation is a form of participation in which consultations are organized between project operators and relevant and affected people. It is also a channel for disseminating information to the public and relevant agencies to understand and provide recommendations for decision-making.

3) Public meetings are aimed at the public, parties involved in the project or activities and those with decision-making power. Use the public forum to understand. There are many methods of hearing meetings, such as community meetings and technical meetings.

4) Public hearing is a meeting with systematic procedures and, more clearly. It is a forum to publicly convey information without concealment to all stakeholders and tributes to the project. The congregation and meeting committees must have a recognized participant composition. There are clear rules and issues for consideration and communicated to all parties.

5) Decision-making is the goal of public participation for people to make decisions about issues. It would carry it out with selecting a representative to be a director with decision-making authority.

6) Use of legal mechanisms: this form is not regarded as direct public participation in preventative and remedial purposes. Instead, it is a form of claiming and defending one's rights due to unfairness to obtain the benefits one should receive. The constitution of the Kingdom of Thailand has provided several principles on the participation of the people. Therefore, people can exercise their rights in the form of individual groups or organizations as provided by law.

In summary, participation consists of participation at the activity level, i.e., news perception, consultation public hearing, a public hearing referendum—involvement at the management level, such as participation in decision-making and using legal mechanisms. Regarding participation in this management level, it must also consider that all departments have equal positions horizontally and vertically; they are involved in the chain of command.

3.1.5 Factors of community participation

Community participation is caused by various factors that make people want to participate. Some scholars have proposed ideas as follows:

Koufman (1949) studied factors related to rural community development and found that age, sex, education, family size, occupation, income, and length of stay in the local area correlated with public participation. While Sriprasat (1999) presented the factors of the involvement that there are three factors affecting participation: 1) personal factors such as age and sex. 2) socioeconomic factors, such as education, occupation, income, and group membership.3) communication factors, such as receiving news from the media and personal media. Meanwhile, scholars have also studied causal factors that focus on personal characteristics, organization, and community. For example, Lapchit (2007) studied the factors affecting decision-making on people's participation in supporting the administration. Subdistrict Administrative Organization which summarizes the issues that are important to include: 1) Person factors such as being the duty of the people volunteer with heart knowledgeable dare to speak up is respected by the people in the community have skills and experience. Therefore, it is beneficial to oneself and the community. 2) Community factor is the community providing support and opportunities for participation and choosing an agent. The community is united and has different groups that encourage participation 3) Organizational factors such as Sub-district administrative organizations operate by the rules and are passionate about solving problems. Therefore, there are also public hearings activities in the community. Consistent with Yoocharoen (2010) studied the causal factors affecting participation in educational quality assurance of schoolteachers under the Office of Vocational Education Commission in Bangkok. This research found that the variables affecting participation consisted of 1) organizational factors such as organizational atmosphere and communication and 2) personal factors such as attitude towards participation and motivation to work that affect participation in educational quality assurance.

In summary, the factors that contributed to the participants were as follows: 1) The personal factors were sex, age, educational level, and experiences 2) community factors, including communities that provide support and opportunities for participation, selection of agents, the

united community and different groups in the community that supports pushing for community participation activities 3) Organizational factors such as organizational atmosphere, communication, rules, attention to problem-solving. 4) Attitude factor is the attitude towards participation and motivation to work.

3.2 Participatory Action Research (PAR)

Participatory action research consists of two major terms:

1) Action Research

The features of action research differ methodologically from other research studies. The basic idea is to study the phenomenon (Phenomenology) of change by stakeholders and researchers to define the problem and conduct research from the situation analysis stage. Operational and evaluation procedures and problem-solving tools focused on social and behavioral science. The role of stakeholders with researchers is essential in every process, including planning, implementation, evaluation, and improvement of new plans using the cooperation of all research participants. This multi-circuit spiral is caused by formulating action plans that must be flexible and change according to the situation. Since the reality of society is so complex that it cannot predict all the necessary actions in advance.

Johnson (Johnson, 2008) defined action research as solving problems that operators are encountering like the process of studying the actual condition or situation of the place of study to comprehend and improve the quality of performance.

Kemmis & Mc Taggart (1988: 10) said action research is a method of research as a spiral of self-reflecting, starting with planning, action, observing, and reflecting. This type of research needs participants in the reflecting process on the process for the improvement. It comes from the belief that knowledge arises from practice, leading to change, development, solution, and utilization with a focus on the learning process during research as a research and development of knowledge acquisition under the action of a practitioner who becomes a researcher or whose who work in partnership with researchers to investigate issues and problems in their own workplace. Ideas are used through cyclical processes, and each cycle depends on the previous

one. Action research is not a pure research method but part of the development. Researchers can employ various methods for collecting data. Action research is both research and action.

        2) Participatory refers to people or groups of people who have the same idea or goal to complete that action based on the specified objectives and receive mutual benefits which must be involved in every step, such as decision-making, action, benefits, and assessment, and community participation must consider the way of life, values, traditions, and attitudes of the community members (Cohen & Uphoff, 1980).

P3.2.1 Participatory Action Research (PAR)

It is a research study approach that has been used since the 1940s. It involves researchers and participants working together to understand and change the problematic situation. There are many definitions of this approach, which have the same common elements. The PAR focuses on social change that promotes democracy and challenges inequality. It is context-specific, often targeted at the needs of a particular group, is an iterative cycle of research, action, and reflection, and constantly seeks to 'liberate' participants to have a greater awareness of their situation to take action.

Kamol Sudaprasert (1994) defined participatory action research as research conducted by an operator to utilize the research findings to solve problems immediately. It must be performed in group and strategy, reflecting the development process with a change from what has been to what is possible at the individual and societal levels. The most important thing lies in the research methodology, which employs a collaborative approach between researchers and stakeholders. Besides, the research process must be democratic, fair, and independent, promoting the value of life. Stakeholders jointly observe and examine situations, reflect on opinions, problems, and obstacles, and investigate alternatives and possible changes ().

Participatory action research allows people in the community to become researchers in planning and making decisions. The process of community participation study throughout community education, problem analysis, planning, action, and monitoring and evaluation. Community participation contributes to development that comes from a community itself and reduces dependency from the outside for people to make decisions together. Villagers are self-reliant,

resulting in a body of knowledge by combining academic knowledge with local expertise by learning together and integrating knowledge from theory (researchers) and action (villagers). The knowledge that people gain from the PAR is a practice that is not merely comprehension but action to change abstract understanding (traditional) into concrete practice. Moreover, PAR is truly research that leads to developing both research methods and human development.

3.2.1.1 Participatory Action Research Methodology

Participatory action research usually employs simple descriptive statistics and descriptive analysis to describe data and techniques to collect both quantitative and qualitative data. It was found that many researchers used research methodology based on the concept of Kemmis and Mc Taggart (Kemmis & Mc Taggart, 1988) on "The Action Research Planner (1988)" as the primary method of research. The concept of Kemmis and McTaggart proposed 4 stage spiral cycles with a flexible starting point, namely 1) Planning: P, 2) Action: A, 3) Observation: O), and 4) Reflection: R. This research cycle is abbreviated as PAOR or a cycle repeating the same activities repeatedly. Reviewing what has been done each time will result in learning that will lead to the adjustment of the next plan. The details are as follows:

1) Plan: This step is to set an action plan based on the prediction of outcomes that may arise from the action plan with a review of past events related to the problem to be solved under the supporting factor and factors that hinder success. The planning includes other conditions at that time. Generally, planning considers flexibility to adapt to future events that may not meet the requirements or be challenging to control in the desired direction. Activities in the action plan must affect the solution to the problem and be consistent with the present social, cultural, and political contexts.

2) Action: The researchers and co-researchers must work together to implement agreed plans and control operations based on the plan. However, the procedure may change following the conditions and limitations of the time. Therefore, good practice must be conducted dynamically, considering what should be done or adjusted to the current conditions. Then, proceed with other activities. In addition, if researchers and participants identify some significant

adjustments to the plan that may affect other parts of the overall project, they can bring the revised group plan to discuss again.

　　　　　　　3）Observation: This step is to collect data on the processes and results of the action performed intentionally and unintentionally and observe the supporting factors hindering the planned activities and various issues during the action to see the conditions. Good observation must be prepared with proper scope, not too narrow as a guideline for reflection, and results must also respond to visible and tangible changes with the flexibility to capture the details of things that can happen in many aspects and forms. Therefore, the action researchers must always be ready to observe the changes in something that may or may not occur as planned. Khemis proposed the types of evidence commonly used for educational practice, namely diaries or journals, field notes, anecdotal or running records, interviews, audio recording, recording events with a video camera or taking pictures, presentations by media, data play, and footnote, document analysis, questionnaires, surveys, and checklists.

　　　　　　　4）Reflection: The reflection is a recall of the recorded actions of critical observation, process and performance as planned and the supporting factors and factors that hinder development. This includes various issues that happened which are in the desired outcome. One strategy for practical reflection is to discuss critically or evaluate the performance of people engaged in research based on the goals. Based on the results from this mutual reflection, researchers and stakeholders may decide and draft a group plan for what to do next, such as relieving common anxiety, action adjustments, etc., where the researchers may continue the previous steps or start a new phase. Moreover, rethinking things requires

reasonably and carefully. However, repeatedly reviewing things is a common practice in participatory action research.

3.2.1.2 Participatory Workshop Process

　　The Appreciation-Influence-Control (A-I-C) process is a creative participatory meeting technique. The process allows community stakeholders to set directions for community development, participate in development activities, and share the benefits as a process that produces collaboration, exchanging knowledge, and information dissemination that will create an

understanding of the problems, needs, limitations and potential of all involved parties. In addition, the process involves brainstorming in solving problems and developing a project implementation model in the community, resulting in decision-making, creativity, and responsibility for community development. The A-I-C consists of steps as follows:

1) Appreciation (A) refers to the learning process and exchanging experiences, providing opportunities for participants to comment, listen, and come to a common conclusion in a creatively democratic way, as well as accepting the opinions of others through drawing as a medium for expressing ideas and can be divided into two parts:

A1: Community current condition analysis

A2: Vision determination as a desirable image in the development by drawing their mind map with the following considerations:

(1) Participants can imagine, think, analyze, and conclude in the form of a picture. This technique can help people who are not good at writing to communicate.

(2) Participants are encouraged to think and speak to describe a picture they drew. It also allows others to ask for information from the picture as an opportunity for discussion and exchange, encouraging people who are not confident to speak to have the chance to present their thoughts.

(3) Compiling individual pictures for a group overview helps to make it easier to collect the thoughts of all participants and create a sense of ownership of the idea as a desirable image of the group.

(4) It fosters a happy and friendly meeting atmosphere. Sometimes, participants thought that drawing was an activity for children. Therefore, a facilitator needs to create an understanding and bring various games about planning, breaking the group's ice, drawing for self-introduction, or drawing pictures of things that they like and do not as a warm-up to prepare the participants.

2) Influence (I) refers to the process of finding methods and proposing alternatives for development based on desired pictures or defining a vision (A2) as a step to find measures, procedures, and reasons to determine development alternatives, set goals, define activities, and prioritize project activities with 2 phases:

I1: Ideas about project activities to achieve objectives based on the desired pictures

I2: Prioritization of project activities with three types as follows:

(1) Activity or project that the local community can perform.

(2) Activity or project who's some parts require support from other organizations

(3) Activities that the subdistrict or community cannot perform on their own but need to ask for support from both public and private sources

3) Control (C) refers to cooperation in work by bringing projects or activities into action and grouping operators for assignment. The steps are as follows:

C1: Sharing responsibility for project development in the community

C2: Jointly define the details of the action and an action plan. The results from the meeting are as follows:

(1) List activities or projects the community can perform on their own under a community action plan.

(2) Project activities in a community requests support from local government organizations and public sectors that support communities.

(3) Project activities that the community must seek resources and coordinate cooperation from cooperation partners, including the public and or private sector.

A-I-C will be employed to conduct meetings for planning activities for research since it is an opportunity for individuals and representatives of organizations in the local community to set a direction for community development, participate in deciding the future of the community, development activities, and receive benefits. A-I-C allows the community to participate in planning and decision-making to create an understanding of operations and build acceptance and responsibility as community members, making sense of belonging and pride in the work in which they are involved. As a result, community development is continuous, leading to high success. Phanthong (2017) said that sustainable community development provides opportunities for individuals and representatives of organizations to take part in determining the direction of community development, deciding the future of the community, participating in

development activities, and sharing the benefits. A-I-C will help the community to take part in planning, decision making, and building understanding, acceptance, and responsibilities as the community member to create a sense of belonging and pride in the work they are involved in, leading to continuity and high success. Therefore, the researcher employed this method in the planning process for the development of a fall prevention model for the elderly in the pilot community, Sakaeo sub-district, Thasala district, Nakhon Si Thammarat province.

3.3 Concepts of Model Development

3.3.1 Definition.

A model is created and developed as a guideline for any work.

Good (1973) has gathered the definitions of a model in 4 types:

1) A model is an example of a thing that can be used as a guideline to create or replicate.

2) A model is an example of a mimic, such as how to pronounce a foreign language for learners, etc.

3) A model is a chart or three-dimensional figure representing something used as a principle or concept.

4) A model is a set of factors or variables related or constituents that can combine and symbolize a social system, which may be written as a formula or in text.

Cummings and Worley (2013: 789) described a model in the glossary as a simplification to be easy to study and understand. It represents a concrete pattern of a theory or an ideal practice for others to learn or change their behavior based on the behavior shown as a model.

Willer (1968: 15) described a model as a set of theories tested for validity and reliability to identify and predict the relationship between variables by mathematical or statistical methods. This emphasizes the credibility of the model, equivalent to a theory.

To sum up, a model refers to the structure or the condensed rational relationship of factors used to describe phenomena for easy understanding as a concrete result. A model consists of at least six components, namely objectives or goals, related variables or factors, system or

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structure, mechanism or process, information and technology used in the model, and the context or environment of that model. A model allows researchers to describe, predict and test phenomena to understand abstract phenomena better.

3.3.2 Model characteristics

Keeves (1988, pp. 561-565) said a usable model should have 4 requirements as follows:

1) A model should be made of a structural relationship rather than an associated relationship.

2) A model should be used as a guideline to predict the consequences of using the model, which can be inspected by observation and supported with empirical data.

3) A model should identify or point out the rational mechanism of the study. Therefore, in addition to being a predictive tool, it should also be used to describe a phenomenon.

4) A model should be a tool for creating new concepts and a relationship of variables in a new way which expands the body of knowledge in the study.

To sum up, the model refers to the factor's structure or the condensed rational relationship. They are used to describe phenomena to be easy to understand and to see concrete. A model with maximum benefits must have the key characteristics, namely, a structural relationship that indicates a rational relationship of the study, to expand the prediction results as a tool for generating new concepts, gaining new knowledge, and can be used as a guide to create or replicate.

3.3.3 Model Construction and Development

3.3.3.1 Model Construction refers to concept determination systematically related to each other to clearly point out what a model suggests, how to offer, what to get, what phenomenon the result explains, and what findings will be discovered (Steiner, 1969; Keeve, 1988: 172), as the following Figure 2.

```
┌──────────┐          prediction         ┌─────────┐     Relation in proposition
│ Solution │ ◄─────────────────────────── │  Model  │ ◄───────────────────────
└──────────┘                             └─────────┘
```
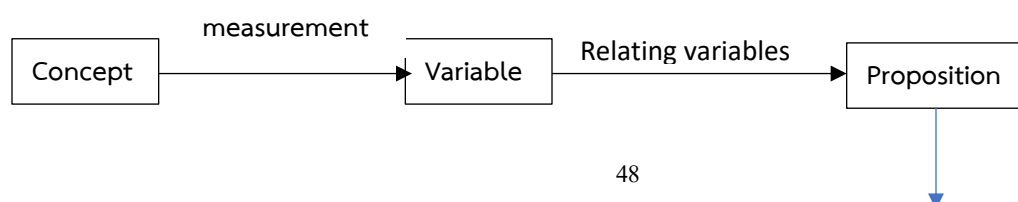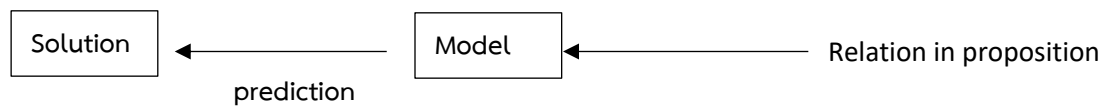
Figure 2. Process of Model Construction (Keeve, 1988)

3.3.3.2 Model Development refers to creating or developing a model as well as testing a model for quality, which might be divided into two major parts: the construct and validity of a model as follows:

  Step 1 Process of model development: Meason, Albert & Khedourri (1985) proposed the process of model development as follows:

  1) Problem Formulation to detect an actual problem.

    - Study-related documents and research to analyze and synthesize the acquired data into a conceptual research framework.

    - Study contextual data in the study area based on stakeholders' opinions, which can be collected through interviews, questionnaires, surveys, and group discussions.

    2) Model construction requires data for analysis and synthesis to formulate a conceptual research framework used to create a model by considering the objectives of the construction and the desired characteristics of the outcomes considering the cost for construction and user needs. When finished, all variables must be covered, and errors must be checked.

    3) Testing

    4) Implementation

    5) Model updating based on objectives and internal and external impacts.

  Step 2 Model Testing: Eisner (1976: 192 – 193) said that a model verification process consisted of two sub-steps:

    1) Trying out a model with a sample unit.

    2) The trial's evaluation allows stakeholders to assess the suitability and possibility of a model as well as correction and improvement based on the results. Then, the results can be summarized. There are several methods of verification of a model. Experts may

assist in the analysis of both quantitative and qualitative empirical evidence. The model verification must consider two characteristics, namely the level of relationship, relevance, reasons between the variables, and the estimation of the parameters of such a relationship, namely time intervals, sample group, a place, or a reference from the sample to find the population. The verification results will lead to two answers: model construction and model improvement or development.

3.4 Health Belief Model

The health belief model developed from Rosenstock's concept (Rosenstock, 1974) portrays that individual perception is an indicator of behavior. People will act or approach what they are satisfied with, think it will benefit them, and avoid what they do not desire. People will avoid the disease since they believe they are at risk of disease affecting daily life. Health behavior practices will be helpful in reducing the risk of illness. In the case that it has already happened, it can help reduce the severity of the disease. It is necessary to consider key sociopsychological factors, such as expenses, convenience in practice, difficulties, and obstacles, etc.

The new health belief model (Becker et al., 1977) was developed using psychosocial theories to analyze a person's health behavior to describe disease prevention behaviors and other behaviors associated with treating disease. The model focuses on the health motivations of seeking treatment for illness and modifying and enabling factors, including population factor, and due to action, to improve the predictability of health behavior, which has been widely adopted for behavior modification. However, the health beliefs model's relevance to behavior modification to prevent falls can be summarized as follows:

1) Perceived susceptibility in the elderly varies from person to person. Those with perceived susceptibility will be aware of the importance of risk surveillance and cooperate in their practice to prevent falls which is a crucial factor in fall prevention behavior.

2) Perceived severity in the elderly would threaten their lives if they do not follow the instructions or cooperate in self-care. The health belief described that although the individual is aware of the potential disease risk, the prevention behavior may not develop. For example, suppose people do not believe that the disease will harm the body or affect them. In

that case, perceived severity and adverse consequences mainly involve psychological behaviors, such as fear and anxiety that are too high or too low.

3) Perceived benefits of taking the health action minus the barriers or cost of that action mean when the elderly is aware that following the instructions to prevent falls, they can avoid or reduce the incidence of falls. However, even if they are aware of the potential risk of falls and the severity of the disease, to cooperate, accept and follow the advice must be provided with the benefits of the practice with the belief that what they follow is a good and proper way that will prevent falls.

4) Perceived barriers are based on the individual's prediction of negative health behaviors, such as perceived inconvenience, expensive expenses, shame, fear, etc. Therefore, the decision to follow the advice depends on weighing the pros and cons of such behavior, and they will choose to act what will result in the pros rather than cons. Rosenstock (1974) defined barriers to conduct as it causes mental conflict. If a person is highly prepared to practice while having barriers, the mental conflict will be difficult to resolve, resulting in behavior avoiding the practice.

5) Health motivation refers to a person's emotion stimulated by various health stimuli. For example, if the elderly tends to reduce the risk or severity of falls, they will be aware of their health and follow instructions. Therefore, motivation is a critical factor that drives people to realize and cooperate in treatment and prevention to reduce the chance of such risks. The motivation can be measured in terms of the need to act.

6) Modifying factors include the relationship between the elderly and health care workers or those involved in caring for the elderly in the community affecting cooperation in following instructions, continuity of health advice, or public relations in the community. Additionally, social factors, such as family members or friends with proper behavior and due to action, may have internal cues, such as illnesses, and external cues, such as information about falls in the elderly and the experiences of family members or close friends. These affect a person's health behavior. Demographic variables such as gender, age, educational background, income, and self-efficacy in recognizing that they can modify health behaviors are also required. This may be more involved in cooperating in fall prevention among the elderly in the community. To sum up, the promotion of perceptions based on the health belief model affects changes in the

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behavior of the elderly and builds cooperation for fall prevention in the community which can be described, shown in Figure 3.

Individual of Perceptions	Motivating factors	Likelihood of action	Integration of perceptions/ Beliefs	Outcome

Individual of Perceptions

Perceived susceptibility (belief concerning the chance of fall)

Perceived severity (belief in the seriousness of fall)

Motivating factors

Perception of risk that a fall will lead to harm

Likelihood of action

Perceived barriers (belief concerning the physical burden of falling) (-)

Perceived benefits (belief in the efficacy of preventing falls strategy) (+)

Integration of perceptions/ Beliefs

Anticipated benefits from trying to prevent falls outweigh the anticipated cost of doing

Outcome

Belief in own ability To attempt strategy

Self-efficacy in fall preventive behavior

Intent to perform fall prevention strategy

Reducing fall incidence

-Education on fall risk and recommendation (media/campaign in a community)
-Social support: Stakeholders in the community
-Cue to action: previous fall

Figure 3. Effects of health belief model on fall prevention behavior among elderly in community

A literature review found that the health belief model has been used to provide health education and promote health behaviors to prevent falls in various ways. Recent studies have found that the health belief model has different influences on fall prevention behaviors among the elderly based on different lifestyles (Stevens, Noonan, & Rubenstein, 2010; Li et al., 2019). Educating the elderly in the community about falls alone may not be enough. The elderly must be ready in modifying their own behavior as well. The health belief model was used to promote awareness among the elderly and their family members on the severity of falls and self-care skills to prevent falls along with the use of due to action from various media for the elderly and their family members to have confidence in their abilities and be ready to participate in activities and intentionally modify their own behaviors to prevent falls continually and sustainably.

4. Related Studies

In this study, the researcher conducted a review of documents and research findings in the past on issues related to factors affecting falls among the elderly and various fall prevention programs both in Thailand and abroad with the following documents:

Khuankhuai (2007) studied factors related to falls among the elderly in the community. This was a retrospective analytical study on 240 elderly people. The results found that age, gender, use of walking aids, high blood pressure, fear of falls, and a fall history were related to falls with statistical significance. The elderly with a fear of falling had a 3.73 times higher risk of falling than the elderly without fear (95% CI of 1.17 to 11.86). The elderly aged 80 years and over had a higher risk and were 2.9 times more likely than older adults aged 60 to 69 (95% CI was 1.32 to 6.36). The older adults with a fall's history, the risk of falls was 2.36 times higher than the older adults without a history of falls (95 % CI equals 1.3 to 4.28). In addition, older adults with hypertension were 2.14 times as likely to fall as those without hypertension (95% CI of 1.18 to 3.88).

Sunanta Phongphaew (2013) studied the factors predicting the fall prevention behavior of the elderly. This study examines the relationship and predictive power of leading, facilitating, and complementary factors affecting fall prevention behaviors among 385 older adults. It found that the sample group had an average high level of perceptions according to the overall health belief model. Affecting fall prevention behaviors of the elderly is statistically significant at p<0.05. Since the result of receiving different information, knowledge, and guidelines about preventing falls would result in differ to prevent falls behaviors.

Phon-in (2017) studied the relationship between personal factors, health status, fear of falling, and anti-fall behaviors of the elderly in the community sample group. One hundred thirty older adults had a history of falling in the past six months living in a community. The study's results revealed that most older adults in the communities studied had high anti-fall behaviors and found behaviors that may cause the elderly to fall due to internal factors, namely lack of exercise. External factors were the lack of checking the stability of the furniture and household appliances. In addition, part of age, and fear of falling, there were positive correlation with fall prevention behavior of the elderly with statistical significance (r = 0.179, p-value < 0.05, and r = 0.408, p-value < 0.01). However, factors of education, occupation, income, and health status, had no relationship with fall prevention behaviors.

Yardley, Donovan-Hall, Francis, & Todd (2006) conducted a descriptive research study on attitudes and perceptions about fall prevention and understanding of risk factors for

falls among 69 older people aged 68-97 who had falls experienced. They assessed by interviewing the perception of risk factors associated with falls and fall prevention behaviors. The study's results revealed that the sample group had a good attitude and perception of fall prevention. There was no difference in understanding of risk factors for falls. Moreover, it was found that public health personnel, family members, friends, and society could motivate the elderly to change their preventive behaviors and recognize the benefits of fall prevention.

Calhoun et al. (2011) conducted a qualitative study on motivating factors and perceived barriers to fall prevention among older adults in the United States. A 50-year-old sample of 15,000 people was collected through in-depth interviews with their health beliefs, practiced behaviors in daily life, attitudes, and fall preventive behaviors. The results showed that older people have perceptions related to beliefs, individual values , and social structure that were statistically significant.

Kittipimpanon et al. (2012) employed a multifactorial program with community participation. The activities in a multifactorial model consisted of risk assessment, education, exercise to increase balance, campaign activities, medication review, environmental risk management in the home, falls management systems in the community, and home visits. The results demonstrated that the incidence of falls was reduced by 24.86%, and the elderly improved fall prevention behaviors.

Punlomso, Srimuang, &Tudpor (2020) studied the effects of a 12-week Health belief model-based Otago exercise (HBM-OEP) program on postural balance (Berg balance scale, BBS) and quadriceps torque in 72 healthy community-dwelling older persons, (control group, n = 36 and HBM-OEP group, n = 36). This group has a higher risk of falls due to poor postural balance and inappropriate fall-related behaviors. Fall-related HBM domains (knowledge, perception, and behaviors) were also recorded at baseline and 12 weeks post-intervention. Results showed that the 12-week HBM-based OEP was effective in improving postural balance and the levels of fall-related health beliefs.

Jitramontree et al. (2015) developed a fall prevention model among the elderly with community participation. The study process is based on Lewin's concept of rational social management and includes three phases: planning, action, and results. Through a collaboration of

the elderly family members, health nurses, community leaders, and health volunteers. Planning is the assessment of the risk of falls. Raising awareness and brainstorming for action planning, the action is working on an action plan and learning the community, a process of stakeholder collaboration, and immediate evaluation. The result was a change in fall preventive behavior, which measured outcomes using the integrated concept of community empowerment.

5. Summary of Literature Review

The problem of falls among the elderly is important since it affects the elderly both physically and psychologically as well as the economy, society, and health care system of the country. Therefore, fall prevention among the elderly is important, especially for the elderly who live in the community. Fall prevention in the community requires the collaboration of those involved in the community. The goal is to keep the elderly safe from falls and provide the community with a fall prevention guideline that is suitable for the community's way of life. Based on studies on concepts and theories on fall prevention, the researcher has applied them as a conceptual framework in research to develop the fall prevention model for the elderly in the southern community by using participatory action research in finding problems and situations of falls and participatory planning meetings for stakeholders in the community who play a role in finding problems, sharing ideas, planning, doing and receiving benefits. In this research, action research was employed according to the concept of Kemmis and McTaggart (Kemmis and McTaggart, 1 9 8 8) as a guideline to research methods with community participation and community research achievements. The development of the program has applied the health belief model in the process of promoting knowledge and awareness of fall prevention so that the elderly in the community have the potential to increase their self-care and provide the community with the fall prevention model for the elderly that is suitable for the community's context.

Chapter 3. Objectives

Chapter 3. Objectives and Research Questions

1. Objectives

      1.1 To examine situations of falls and the fall prevention measures in elderly people before development.

      1.2 To develop a fall prevention model with the community participation.

            1) To create a mechanism in the community to drive the fall prevention program in the community.

            2) To study the effectiveness of the fall prevention program.

      1.3 To conclude on the fall prevention model for community-dwelling older adults.

2. Research Questions

      2.1 Primary Research Questions

            1) What is the situation of falls among the elderly in the community in southern Thailand before development?

            2) What is the situation of elderly falls in the pilot community Before development?

            3) What is the fall prevention measure for the elderly before development?

      2.2 Secondary Research Questions

            1) What are the components of the participatory fall prevention model in the pilot community?

            2) What are the mechanisms for implementing the participatory fall prevention model in the community?

            3) What are the outcomes of the developed fall prevention model in the pilot community?

            4) What are the problems and solutions in the participatory fall prevention implementation?

Chapter 4. Methodology

Chapter 4. Methodology

This study consists in a participatory action research with an objective to develop the fall prevention model for the elderly in the Southern community. It was conducted under action research according to Kemmis and McTaggart's concept (Kemmis and McTaggart, 1988), including planning, action, observation, and reflection along with guidelines for conducting research as follows:

1. Research Design
2. Population and Sample
3. Research Instrument
4. Instrument Creation and Validation
5. Methodology
6. Data Collection
7. Data Analysis and Statistics
8. Research Ethics

1. Research Design

This participatory action research employed a mixed method including quantitative and qualitative research. There are three phases of the study process, which are preparation, model development, and evaluation. In the development phase, the development of the model was based on Kemmis and McTaggart's concept (Kemmis and McTaggart, 1988), including three steps: planning, action, observation, and reflection. The process was in a form of a cycle to study the procedures and results of the development of the fall prevention model for the elderly in the Southern community. The details are as follows:

Phase 1: Preparation

1. The researcher prepared knowledge and understanding for conducting research by studying information from documents, textbooks, concepts, and related theories and being the coordinator, observer, and atmosphere creator in the activities

We prepared the study areas in 20 communities from 7 southern provinces, including Nakhon Si Thammarat, Phatthalung, Surat Thani, Songkhla, Krabi, Trang and Chumphon. We selected the pilot community area to study the development of a fall prevention model. Firstly, we coordinated with those involved in working teams in the area to ask for cooperation in conducting research and explained the objectives of the research. The Sa Kaew sub-district, Tha Sala district, Nakhon Si Thammarat province, was selected based on the purposes of the participatory study, which requires cooperation from the community and informants. Therefore, the study will be successful based on the following conditions:

1) The selected communities participating in "The development of the elderly care system in the Southern community project" voluntarily participated in this study.

2) Regarding the development of the fall prevention model for the elderly in the community, the pilot community in Sa Kaew subdistrict, Tha Sala district, Nakhon Si Thammarat, was selected since the area has the following criteria:

(1) It is a community area in Nakhon Si Thammarat province that is convenient for the research team to travel for collecting information from the voluntarily participating community.

(2) There is cooperation in all community sectors, and the area was conducive to studying the model development.

(3) There are problems of falling among the elderly in the community that have unclear formative solutions.

Phase 2: A Model Development

This phase consists of 4 steps based on the concept of Kemmis & McTaggart (Kemmis and McTaggart, 1988) as follows:

Planning: Organize a workshop for the committees in the pilot community. The community leaders were involved in analyzing problems in the area and formulating development guidelines. The process consists of designing development guidelines, selecting the important problems, creating action plans, and assigning tasks.

Action: The fall prevention program in the community was conducted together by the people in the community. The effectiveness of the fall prevention program was tested.

Observation: Assessing knowledge, fall prevention behaviors, the elderly's satisfaction with participating in the project, and the participation of those involved in the development of the fall prevention model in the community.

Reflection: A monthly community leaders meeting was held to reflect on the performance of the development of the fall prevention model to find the success factors, problems, and obstacles.

Phase 3: Evaluation

1) Organize a forum to learn lessons in the pilot community.

2) A forum was organized for presenting the results in the pilot community to the representatives from 20 communities along with lessons learned. The involved give feedbacks and recommendations to improve the fall prevention model based on the community context.

2. Population and Sample: The researcher has divided them as follows:

2.1 Population

2.1.1 Community leaders from 20 communities in 7 southern provinces.

2.1.2 Elderly population from 20 communities in 7 southern provinces based on population statistical reports aged 60 and over in each community finding 31,530 people.

2.1.3 Stakeholders in the development of the fall prevention model for the elderly in the pilot community.

2.1.4 Elderly people with house registration in Sa Kaew subdistrict, Tha Sala district, Nakhon Si Thammarat province, totaling 1,712 people.

2.2 Sample

The sample was divided for quantitative data analysis, qualitative data analysis, and program performance testing as follows:

2.2.1 Sample Group for Quantitative Data

It was divided into 2 groups as follows:

2.2.1.1 The sample group of the elderly for the study on the situation of falls among older adults in the southern communities was obtained from secondary data from the Elderly

Health Information from databased JHCIS in 20 sub-district health promoting hospitals in 7 southern provinces, totaling 12,130 people.

        Inclusion Criteria

          1) Elderly people aged 60 years old and over

          2) Complete data on fall history and factors related to falls.

        2.2.1.2 The sample group for the study of problems in falls among the elderly in the pilot community consisted of 350 elderly people in Sa Kaew subdistrict, Tha Sala district, Nakhon Si Thammarat with the following criteria:

        Inclusion Criteria

          1) Elderly people aged 60 years old and over.

          2) Being able to communicate and read in Thai.

          3) Consent for providing information in the interview form.

        Exclusion Criteria

          1) Having a congenital disease with a serious illness that impedes data collection, such as a hearing-impaired person who cannot communicate.

          2) Inability to provide complete information based on the interview form.

          The sample size was calculated based on Taro Yamane from:

          $n = N \div (1 + Ne^2)$.

             n= Sample size

             N = Total elderly population aged 60 and over in the community (1,712)

            e= Error value used in research (0.05)

          The sample group in this research consisted of 350 people.

    Sampling: The researcher compiled the information about the elderly in all 11 villages to create a sampling frame divided by villages. Then, each elderly person was coded from 0001 to 1712. Then, simple random sampling was performed using a random number table using 2 digits that matched the last 2 digits of the elderly's ID number. The elderly who has the same identity as the random number was selected as a sample. If the number is repeated, choose the next number, and continue the sampling until the sample size is fully proportional to each village.

2.2.2.1 The informants who provide the information on fall prevention measures in 20 communities and current operational problems consist of the administrators of Sub-district Health-Promoting Hospitals (SHPH) or the executives of Subdistrict Administrative Organizations (SAO), totaling 20 people, as the details are shown in Table 1.

Table 1. The informants who provide the information on current fall prevention measures

Province	Administrators of SHPH (N)	Executives of SAO (N)
Chumphon	1	1
Krabi	1	1
Nakhon Si Thammarat	4	3
Phatthalung	1	1
Songkhla	1	1
Surat Thani	1	2
Trang	1	1

2.2.2.2 The samples were obtained from purposive sampling to study the perception of falls in the elderly in the pilot community. The informants consisted of people involved in the elderly care in the community as follows:

1) The representatives of elderly in the community totaling 11 people.

2) Community leaders and policy and budget makers, including:

- Executive of sub-district administrative organization, totaling 1 person.

- Village headmen, totaling 11 people.

3) Elderly caregivers, including:

- Staff (nurses) from 2 sub-district health promotion hospitals, totaling 2 people.

- Village health volunteer leaders, totaling 15 people.

Inclusion Criteria

1) People involved in the elderly care in Sa Kaew subdistrict.

2) At least 1 year of working experience in the elderly.

3) Willing to participate developing the fall prevention model for the elderly in the community.

Exclusion Criteria refer to the inability to participate in the study until its completion due to sickness or the need to travel outside the area during the research.

2.2.3 Sample Group for Performance Testing of a Multifactor Fall Prevention Program

The sample group consisted of 30 elderly people in Sa Kaew sub-district with the following criteria:

Inclusion Criteria

1) Elderly people aged 60-75 years old in Sa Kaew sub-district

2) A time up and go test (TUG) with a cut-off score of more than 13.5 seconds

3) The result of the Barthel ADL index (ADL) of 12 scores or higher out of 20

4) Risk of falling of Thai FRAT ≥ 4 scores

Exclusion Criteria

1) Limitations on exercise specified by the responsible physician.

2) Psychiatric problems that hinder participation in group activities.

3) Elderly and/or caregivers' objection to participate in the study.

4) The elderly who are participating in physical activities with other groups.

2.2.4 Informants in the Evaluation Phase

1) The forum presenting lessons learned in the development of the fall prevention model in the pilot community included working groups in Sa Kaew subdistrict, totaling 50 people.

2) The informants in the lesson learned forum on the development of the fall prevention model in the southern community included 20 representatives from 7 southern provinces, namely Nakhon Si Thammarat, Phatthalung, Surat Thani, Songkhla, Krabi, Trang, and Chumphon, totaling 50 people as shown in Table 2.

Table 2. Contributor details in the discussion forum on the developed fall prevention model

Province	Representatives of Stakeholders from 20 communities	Representatives of elderly (N)	Researcher team and experts in the elderly care
Chumphon	2	1	
Krabi	2	1	1
Nakhon Si Thammarat	7	3	15
Phatthalung	2	1	1
Songkhla	2	1	1
Surat Thani	3	2	1
Trang	2	1	1

3. Research Instrument for Data Collection

In this research, research instruments for data collection for the development of the fall prevention model for the elderly in the community are as follows:

3.1 Instruments to Study Community Context and Fall Situations

In this phase, data were collected from both the quantitative and qualitative data with instruments as follows:

3.1.1 Instruments for Quantitative Data

1) Secondary data records on falls of the elderly from 20 subdistricts in 7 southern provinces.

2) The general questionnaire of the elderly in the pilot community, including gender, age, marital status, educational background, average monthly income, and fall records within 1 year.

3) The questionnaire on the fall prevention behavior of the elderly.

3.1.2 Instruments for Qualitative Data

The instruments were developed by reviewing the literature on Practices to Prevent Falls by the Institute of Geriatric Medicine, Ministry of Public Health, and verified by the Index of Consistency (IOC) by three experts as follows:

1) In-depth interview questions for the elderly, family caregivers, and network partners involved in the perception of falls in the elderly had IOC of 0.9.

2) Questions in the group discussion of the family caregivers and network partners on fall prevention awareness and management by the community had IOC = 0.9.

3) Environment observation form on falls among the elderly at home and in the community had IOC = 1.0.

3.2 Instruments in the Development Phase

3.2.1 The instrument used in the research

It was the drafted fall prevention program among the elderly with community participation created by brainstorming, meeting of elderly representatives and leaders of network partners in the community with the researcher as a facilitator in various aspects. The issues specified in the model consisted of goal setting, determination of success, guidelines for fall prevention for the elderly based on the concept of community participation, and joint design of a multifactorial fall prevention program at home with exercise to train muscle strength and balance by applying health belief model theory. The fall prevention program was conducted for 16 weeks with 5 steps as follows:

Step 1: A meeting was held to clarify the objectives of the study and introduce the researcher and research assistants to build relationships and collect data before the experiment.

Step 2: The training was provided to raise awareness of self-care to prevent falls as a group for the elderly and their caregivers about the situation of falls in the elderly, perceived susceptibility, perceived severity, perceived benefits of taking the health action minus the barriers or cost of that action, knowledge on self-risk assessment, review of the correct drug use, advice on how to adjust the environment in the house to be safe, exchanging experiences, and joining the discussion.

Step 3: The research team visited the sample's house to promote the elderly to do exercise at home by demonstrating and practicing exercises to increase muscle strength and balance based on the Otago Program, installing a vinyl banner showing home exercise steps, giving a self-care handbook, and visiting the elderly by family village health volunteers to encourage exercise once a week for 16 weeks.

Step 4: Assess and modify the environment to be safe by visiting homes with community networks. Encourage family members to play a part in improving the environment as well as coordinate with people responsible in the community to solve the high-risk environment with urgent correction.

3.2.2 Instruments in the Program:

           1) Fall prevention education program according to the health belief model concept.

           2) learning materials

           3) a fall prevention self-care handbook

           4) a vinyl banner showing exercise steps with explanations installed at the sample's home.

           5) an individual exercise record of the sample while participating in the program.

3.2.3 Instruments for Data Collection: Outcome comparison assessment form before and after participating in the fall prevention program at home as follows:

3.2.3.1 Instruments for Qualitative Data Collection

           1) Stakeholders' discussion group record form to record the participants' information who provided comments and suggestions throughout the activity.

3.2.3.2 Instruments for Quantitative Data Collection

           1) The questionnaire on the fall prevention behavior of the elderly is a developed tool with a series of questions showing the frequency of daily activities in preventing falls among the elderly in the past 1 week. It consisted of 25 questions which were all positive questions as a Likert's rating scale, divided into 3 levels, from 3 scores as high level to score as low level. For the interpretations, the regular activity is 3 scores. An occasional activity is 2 scores, and a never practiced activity is 1 score. The interpretation based on the mean was divided into 3 levels (Best, 1997; Daniel, 1995) as cited in Klangkarn, & Promsattayaprot (2010). Moreover, the evaluation was based on the criteria of the mean score as follows:

           A score between 2.34–3.00 refers to fall prevention behavior at a high level.

           A score between 1.67-2.33 refers to fall prevention behavior at a moderate level.

           A score between 1.00-1.66 refers to fall prevention behavior at a low level.

           2) Time Up and Go Test: The elderly was required to sit in a chair and get up and walk back and forth for 3 meters and return to the same seat. The time was counted the moment

a participant got up from the chair and stopped when the bottom touched a chair. The criteria used to classify the fall risk group was a person who took the test time greater than or equal to 13.5 seconds which was considered at risk of falling (American Geriatrics Society and British Geriatrics Society, 2011).

3) 30 Second Chair Stand: This was to assess leg strength and balance by sitting up consecutively within 30 seconds and counting the times. The criteria are specified based on the age range from 8 to 14 times. If less than 8 times, the leg muscles are not strong, predicting that there is a risk of limited ability to walk on a flat surface, use stairs, get out of bed or chair, and get in and out of a car. Also, there was a risk of falling (Rikli &Jones, 1999).

4) 4 Stage Balance Test: Test methods included side by side stand, full tandem stand, semi tandem stand, and one leg stand within 10 seconds. For scores, 0 = fail. 1 = pass with support, and 2 = pass without support (CDC, 2017).

3.3 Instruments for Evaluation

3.3.1 Quantitative Data

1) The satisfaction questionnaire towards participating in the fall prevention project in the community: 10 questions on the 5-level rating scale with scores between 1-5 indicate the level of satisfaction with the project. 5 scores mean the most satisfaction and 1 score means the least satisfaction. The average score criteria are divided into 3 levels as follows:

A mean of 3.67 -5.00 refers to a high level of satisfaction.

A mean of 2.34 -3.66 refers to a moderate level of satisfaction.

A mean of 1.00 -2.33 refers to a low level of satisfaction.

3.3.2 Qualitative Data

1) Related parties' observation form was based on information provision, planning, implementation, and participation in lessons learned.

2) Related parties' group discussion record was used as a guideline for a group discussion and a record of participants' comments and suggestions during the activity.

3) Lessons learned format reflected on results of the development of the fall prevention model to find the success factors and key events and conditions, leading to success, development, and implementation mechanism.

4. Instrument Creation and Validation

4.1 Instruments for Data Collection and Fall Prevention

There are steps as follows:

1）Study the content of the model research and development, documents, academic textbooks, and related theories.

2) Study the guidelines for preventing falls for the elderly in all dimensions.

3) Study participatory action research.

4) Study health belief theory and the Otago program, and review fall prevention guidelines to draft the fall prevention program for the elderly.

5) Employ content, documents, textbooks, concepts, theories, and related research results as a framework for defining research guidelines and creating instruments.

6) Propose instruments to the advisor for verification and bring the feedback to improve them.

4.2 Research Instrument Validation

4.2.1 Quantitative instrument validation

4.2.1.1 To check content validity, all the instruments were verified by 3 qualified people to check the appropriateness of the language used by finding the Index of Item Objective Congruence (IOC). The level of opinions by 3 experts who rate each item into 3 levels as follows:

Rating 1 when the questions are consistent with the objectives and cover research variables.

Rating 0 when uncertain to decide whether the questions are consistent and cover research variables.

Rating -1 when the questions are not inconsistent with the objectives and do not cover research variables.

For the interpretation of IOC, an IOC is equal to or greater than 0.5 is acceptable that the questions are consistent with the objectives. If any question has an IOC of less than 0.5, such a question will be renewed based on the objectives from the expert examination. To check the IOC in each question, at least two of the three experts agreed with each question having an IOC greater than 0.7, indicating that the questions are appropriate for the interview to study the development of the fall prevention model for the elderly.

4.2.1.2 Reliability was identified by trying out instruments corrected by the advice of experts with the sample in Tharuea subdistrict, Mueang district, Nakhon Si Thammarat, totaling 30 people. The area had similar cultural, social, and living structures and sizes similar to the studied area to test the clarity of the questions and language comprehension. Cronbach's alpha coefficients were identified.

(1) The fall prevention behavior assessment form had Cronbach's **α** of 0.85.

(2) The satisfaction questionnaire of the elderly towards the program had Cronbach's **α** of 0.9, indicating a high level of reliability that can be employed to collect data.

4.2.2 Qualitative instrument validity was assessed by experts giving an overview of language content and coverage by finding the index of item-objective congruence (IOC).

5. Methodology

The research methodology and activities designed to achieve results consist of 3 phases namely preparing, developing a model, and evaluating as shown in Figure 4 and details are as follows:
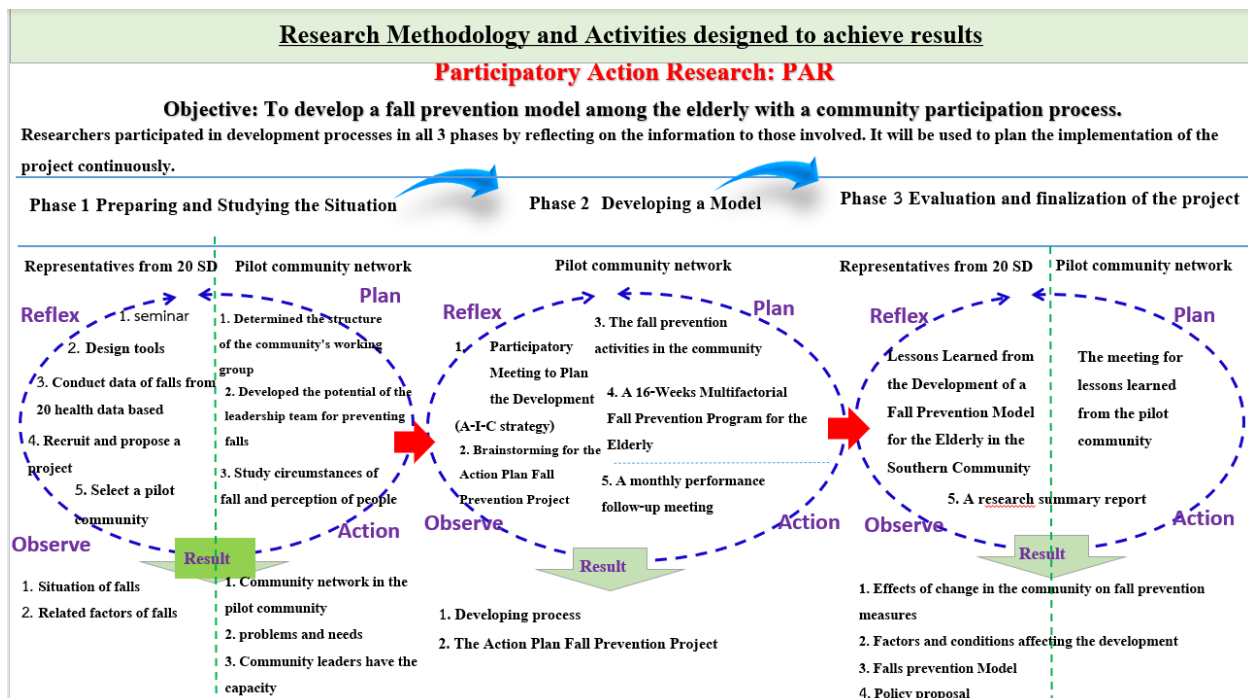
Figure 4. The research methodology

5.1 Preparation

1）The research team was prepared in terms of knowledge and understanding for conducting research as well as concepts related to the fall prevention guidelines among the elderly in all dimensions by studying information from documents, textbooks, concepts, and related theories as well as being the coordinator, observer, and atmosphere creator in the activities.

2) For area preparation, the research team attended the meeting in the project on "Development and Research for Elderly Care by Local Communities" and proposed the project objective of "the development of the fall prevention model for the elderly in the southern community", including inviting 20 communities to participate in the project.

3) Coordinated with representatives from 20 communities (sub-districts) to ask for secondary data on elderly falls in each area and coordinated with the relevant stakeholders in the pilot community area to ask for cooperation to understand the research objectives, action plans, and data collection so that relevant people can communicate with the community to create mutual understanding.

4) Studied the prevalence and factors related to the history of falls in the past 6 months among the elderly in 20 subdistricts from 7 southern provinces. The secondary data were obtained from the databased JHCIS of the sub-district health promoting hospitals of each community to analyze the relevant risk factors from the literature review, including physical and environmental factors, and risk behaviors.

5) Observe information from the document on fall preventive measures: Focus group discussion and in-depth interviews with the involved people in the elderly care from 20 sub-district. Open-ended questions focus on perception, fall prevention measures, and current operational problems.

6) Studied the situation of falls in the pilot sub-district and searching for potential and social capital of the community including the context of the area was done by collecting a questionnaire from 350 elderly people in the community.

7) Studied the qualitative data on perceived falls and existing fall prevention practices in the pilot community through the focus group discussion and in-depth interviews.

8) The project implementation committee on the development of a fall prevention model for the elderly in Sa Kaew sub-district was recruited to jointly define the structure and clear roles and responsibilities of the working group.

9) Determined the structure of the community's working group by recruiting people involved in the community with clear roles and responsibilities.

10) Developed the potential of the leadership team for preventing falls in elderly people. Since the leadership team is the main mechanism for driving work in the community. The meeting for learning according to program activities. The researcher provided knowledge on content and practical training for two days with pre-research activities as follows:

(1) The research team and community leaders presented information about the situation of falls in the Sa Kaew sub-district community obtained from the survey to create understanding and awareness of the problems.

(2) The workshop was held for community leaders to understand the fall prevention program, training to educate and reverse demonstration to promote knowledge and skills in assessing the risk of falls. In addition, the skill of evaluating the home environment at risk

of falling and exercise training abilities and learning guidelines for home visits for evaluation and exercise tracking guidelines for the sample group.

5.2 The Development Phase of the Fall Prevention Model in the Community

The researcher proceeded under the process study of PAOR by Kemmis & McTaggart (Kemmis and McTaggart, 1988), including the concept of community participation (Cohen & Uphoff, 1980) and the health belief model theory (Becker et al., 1977). This phase consists of 2 activities, and each activity consists of 4 steps as follows:

Activity 1: The meeting of the committee on the development of the fall prevention model for the elderly in the community

Step 1 Planning

1) A meeting of the working group in the community and network partners who were involved in the elderly care in the community was held to clarify the objectives, roles and responsibilities, procedures, and data collection to plan together for the development of the model so that the relevant parties can communicate to the community for acknowledgment and mutual understanding.

2) The working group in the community and related network partners jointly formulated an action plan and the assignment of responsible parties.

Step 2 Action: The specified plans were implemented by a workshop to jointly design the fall prevention model for the elderly in the community. The model is based on the concept of community participation by using A-I-C to draft activities in the multifactorial fall prevention program at home. Media and tools were used to develop the model and to select the sample group to conduct a program based on inclusion criteria and the willingness of the elderly.

Step 3 Observation: The participation of the working group and community network partners was assessed.

Step 4 Reflection: The questions were created using AAR (after action review) with the research team by analyzing questions, such as the expected goals of the activities, activities that achieve goals, unsuccessful activities, useful lessons, and suggestions for improvement.

Activity 2: Fall Prevention Project for the Elderly in Community

Step 1 Planning: A group discussion by the research team in the community was held for planning activities. The duration of community activities is six months, with monthly follow-up meetings and communication for meetings through the LINE Application. The action plan consists of 2 activities: fall prevention activities in the community and the performance testing of the home-based fall prevention program.

Step 2 Action: A fall prevention for the elderly project including two parts; a fall prevention activity in the community and a 16-weeks fall prevention program for the elderly at home with details as follows:

2.1 The fall prevention activities in the community

The actions consisted of 4 sub-activities as follows:

1) Screening for the risk of falling among the elderly in the sub-district.

2) Public relations campaign to raise awareness in the community by placing public relations banners at an essential point of each village, and in front of 2 health promoting hospitals, totaling 12 points, using the.mp4 to open an advertising and short knowledge through the village community radio every Saturday and Sunday.

3) Promoting exercise to increase muscle strength and balance in the community consists of campaigning in the elderly club in every village once a week and promoting it in the chronic disease clinic of the hospital once a month. A trained village health volunteer team operated these activities.

4) Promoting environment modification to be a safe community for falls.

2.2 The program trial of home-based multifactorial fall prevention program

A quasi-experimental study to test home-based fall prevention programs among 30 elderly people in Sa Kaew sub-district was conducted from June 2020 to October 2020 for 16 weeks, and details are as follows:

Week 0: Before the program started, the research team arranged a meeting to clarify the objectives, introduce researchers and research assistants to build relationships and collect data before the program, including

1) General information

2) A questionnaire on a fall prevention behavior among the elderly

3) 30 Second Chair Stand test

4) Time Up and Go test (TUG)

5) 4 Stage Balance test

Week 1: The workshop for the elderly and their caregivers for 2 days with the following activities:

Day 1: According to the health belief model, health education activities consist of the perceived risk of falling, Perceived severity of a fall, Perceived Benefits of Fall Prevention, and Perceived self-efficacy in preventing falls. Activities included lectures accompanying teaching materials, and group discussions to exchange experiences among the elderly, caregivers, community nurses, village health volunteers, and the researcher. According to the environmental assessment and management manual, they were assigned to return to assess the home environment at home.

Day 2: The exercise demonstration activities, including muscle strength training and balancing, were developed from the Otago exercise program. The program suggests exercises at home four days a week (every other day) for 30 minutes each time. There are two levels of training, including the easy level with 16 poses and the difficult level with 18 poses with instructions and methods for assessing the physical condition of the sample to prevent the risks from exercise. The assessment to divide the level of training had four questions. If the elderly can do all four questions, they can exercise at a difficulty level. They must exercise in an easy class; if not (only one query). Exercise movements in each group are shown in the appendix. This program includes a home visit between the research team and each sample.

Week 2, 3: For a home visit by the main researcher with research assistants who are community nurses and VHV leaders trained through exercise muscle strength and balance training as a mentor to the elderly. Individual risk assessment activities, medicine reviews, and home environmental management advice were also activities. Training exercises to increase muscle strength and balance should be done at least 3-4 times a week for 30 minutes, along with general exercises, such as walking for at least 10-20 minutes. In addition, a vinyl banner to demonstrate exercise steps was installed at the sample's home and provided a self-care guide booklet to

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prevent falls. In exercise activity records, the participants were required to record it every time they exercised. This included advice on individual risk management suitable for each person as well as encouraging the elders, relatives, or family members, and the transfers to experts are available in case of unmanageable risks along with the next follow-up visit.

Week 4-16: The elderly worked with their caregivers, and home visits were done by the trained health volunteer once per week. During this period, we operated fall prevention activities in the community consisting of public relations campaigns in the community, such as the banner campaigning for a safe environment for the elderly from falls at various spots in the community. Health education was provided to prevent the risk of falls among the elderly through the community's radio and in the chronic disease clinic in the sub-district health-promoting hospital once a month.

Week 6, 8, 10, 12, 14: The research team collected data on home exercises through the Line Application.

Week 16: Home visit and evaluation of physical performance after joining the program included a TUG test, a 30-second chair stand test, and a 4-stage balance test, including assessing fall preventive behaviors and satisfaction in the program.

Step 3 Observation: The participation in activities of the elderly and their caregivers was observed in 2 parts:

1) Fall prevention activities in the community

The researcher observed and recorded the participation of stakeholders in developing a fall prevention model throughout the study.

2) A 16-week Multifactorial Fall Prevention Program for the Elderly

The observation and recording activities consist as follows:

(1) Assessing fall prevention behaviors before and after the workshop on promoting awareness of fall prevention among the elderly.

(2) Assessing the TUG Test, 30-second chair stand Test and 4-stage balance Test before and after the program.

(3) The participants were observed participating in the program.

(4) Home visits to observe by taking photos, reporting individual risk factors before and after the program, and monitoring the participation of the elderly and their caregivers.

(5) The personal exercise recording was observed to evaluate the continuity of the exercise.

(6) The assessment of the elderly's satisfaction with the program.

Step 4 Reflection: The minutes of follow-up of community leaders and researchers once a month on the program's success, obstacles, and solutions during implementation. Finally, the effectiveness of the program was reflected, including health outcomes, such as muscle strength and balance, fall preventive behaviors, and satisfaction in the project, as well as recommendations by the community research team.

5.3 Evaluating the developed model

There were 2 activities as follows:

5.3.1 A forum for lessons learned in the pilot community

The leader's team in the community participated in the lesson learned forum and presented the result of the developed fall prevention model to those involved in elderly care in the community.

Step 1 Planning: Clarified the objectives of lessons learned forum to those involved in the community.

Step 2 Action: A forum for lessons learned was organized to summarize the results of the developed fall prevention model in the pilot community. The research team, the project committee, and representatives of the elderly, and the sub-district administrative organization together conducted lessons learned with 4 main questions. 1) Is the outcome of the development really successful? Have there been any achievements beyond expectations? 2) What key activities and conditions led to success? 3) How did the development and implementation take place? How were they, including the assignment of roles and functions, resource allocation, knowledge management, etc.? And 4) what are opportunities for continuity and sustainability of the project including an opportunity to create a community policy to organize a fall prevention system for

the elderly in the community and summarize the fall prevention model for the elderly in the community?

Step 3 Observation

The participants and community stakeholders' opinions were recorded.

Step 4 Reflection

Community stakeholders' satisfaction with the model development process was assessed to find the success factors and problems and obstacles in the implementation of the development of the fall prevention model for the elderly in the community.

5.3.2 The presentation of the results of the fall prevention model development I 20 pilot communities

A meeting was held with community leaders from 20 communities in 7 southern provinces to present the results of the development of the fall prevention model in the pilot community and brainstorm recommendations to improve the fall prevention model in the community to be better.

Step 1 Planning A meeting was held in form of a video conference or a virtual meeting due to the COVID-19 epidemic to clarify the objectives of a forum for lessons learned for representatives from 20 communities in 7 southern provinces and those involved.

Step 2 Action The presentation of the study results in the pilot community, the demonstration of the fall prevention skills by the pilot community leaders, and the forum for lessons learned had the main questions as follows: 1) What are the components of the fall prevention model for the elderly with community participation? 2) What are the key activities and conditions leading to success? 3) How did the development and implementation take place? How were they, including the assignment of roles and functions, resource allocation, knowledge management, etc.? And (4) what are opportunities for continuity and sustainability of the project including an opportunity to create a community policy to organize a fall prevention system for the elderly in the community and summarize the fall prevention model for the elderly in the community?

Step 3 Observation The participants' opinions and attention were observed.

Step 4 Reflection The reporting of lessons learned encouraged all communities to share their opinions and summarize the fall prevention model for the elderly with community participation.

6 Data Collection

The researcher worked with a community researcher team with 3 phases of data collection as follows:

6.1 A study of the fall circumstances of the elderly before the model development

6.1.1 Studied the fall situations in 20 communities from 7 southern provinces in Thailand.

1) Quantitative data were collected from secondary data from the JHCIS of the sub-district health promoting hospitals of 20 communities (subdistricts). A total of 12,130 samples were obtained with complete information according to inclusion criteria.

2) Qualitative data were collected from observing the document on fall preventive measures, including focus group discussions and in-depth interviews with the involved people in elderly care from 20 sub-district. Open-ended questions focus on perception, fall prevention measures, and current operational problems.

6.1.2 Studied the fall situation and the area context in the pilot community to understand the fall situation divided into 2 types:

1) Quantitative data were collected from the questionnaire from a sample of 350 elderly people. The research assistants were trained to collect data before the process.

2) Qualitative data were collected from in-depth interviews with the elderly and those involved in the elderly carein the area about the perceived falls and the management of falls in the community.

6.2 Model Development Phase

6.2.1 A participatory workshop to jointly design processes and implement a draft model using the A-I-C (Appreciation-Influence-Control) technique.

Qualitative data were collected by observing and recording project proposals and the draft of the action plan.

6.2.2 The fall prevention project in the community:

Qualitative data were collected from observing and recording the involvement of stakeholders in fall prevention activities in the community throughout the study.

6.2.3 Trial of the effectiveness of home-based fall prevention programs

Quantitative data collected before the experiment consist of general characteristics of participants, the fall preventive behaviors assessment, a TUG test, a 30-second chair stand test, and a 4-stage balance test. The appointment for data collection after the completion of the program was in 16 weeks to assess the satisfaction of the elderly.

Qualitative data were collected from observing and recording in the monthly meeting minutes, recorded the results of home visits on the agenda of the VHV team, and verified the completeness of the qualitative data before analysis.

6.3 Evaluation Phase

Qualitative data were collected as follows:

1) Data were collected from the lessons learned among stakeholders in the pilot community regarding success factors, problems, development in creating a community policy to prevent falls for the elderly, and stakeholders' interviews on satisfaction with the model development.

2) Data were collected from the lessons learned among representatives from 20 communities in 7 southern provinces, recommendations for developing the fall prevention model, and policy proposals for fall prevention for Thai elderly in communities.

7 Data Analysis and Statistics

Quantitative survey results are presented in reports using tables and qualitative results in the narrative.

7.1 Quantitative Data Analysis

The statistical analysis in this research was done by the SPSS version 25, consisting as follow:

7.1.1 Descriptive statistics to describe the data and analyze general data of the target group include frequency, percentage, mean, and standard deviation.

7.1.2 In analytical statistics, we generated weighted prevalence estimates and proportional differences between characteristics of fallers and non-fallers using chi-square tests with a cross-tabulation. Further, Bivariate data were analyzed using logistic regression statistics. In calculating odds ratios, the ratio is between an event of interest (y=1) and no incident of interest (y=0). The 95% confidence interval was determined to find the predictive factor of a fall. In the multivariate logistic regression, the associated variables were selected into the equation using the enter method to describe the predictive factors for falls.

7.1.3 Inferential statistics are as follows:

1) Comparative analysis of muscle strength, balance duration, and fall prevention behaviors of the sample group before and after the program was done by Kolmogorov–Smirnov test to determine the distribution of the data, showing a normal curve distribution. Therefore, the referential statistic was tested by Paired t-test.

7.2 Qualitative Data Analysis

Data analysis was done by content analysis from the study, such as in-depth interviews, a group discussion, lessons learned, and participatory observation. Then, data were categorized according to the issue, interpreted, and analyzed with the following steps:

Step 1: The theories, concepts, and conceptual framework in qualitative research were obtained from various research results, summarized as a body of knowledge and ideas related to research problems as a broad framework in data analysis.

Step 2: Data were validated to ensure that the data met research problems.

1) The data reliability was verified through triangulation by collecting data from many sources, including in-depth interviews with people involved in elderly care, a group discussion, and observations to verify the accuracy of data from all sources to see if they are related.

2) The completeness of data was checked. The researcher considered whether the information from interviews and a document study had enough content to answer the research problem or not throughout the research period.

3) Note-taking and indexing, according to Miles and Huberman (Miles. & Huberman 1994), included data organization according to the following procedures. The raw data from the field were for analytical reading with data reduction to manage data by linking the data to the conceptual framework of the issue studied. Only meaningful content is selected and interpreted into a theme in the program to present those data systematically and efficiently.

4) Conclusion, interpretation, and verification were made to draw conclusions and interpret the findings.

5) Conclusion was to answer the research questions by linking the relationship of the sub and then using it to write a research report.

6) Data from a field, the workshop, a forum for lessons learned, and visiting the elderly during field employed observation and talking to local people/communities and those involved in the operation, including taking photos. Especially the home environment improvement for the elderly; these data were recorded in the field notes and used in the content analysis.

7) Qualitative data were transcribed and scrutinized iteratively by the primary researcher and second researcher. A third researcher was available to arbitrate any disagreement and facilitate consensus.

8 Permission and ethical considerations

The Ethics Committee in Human Research accredited this research, Walailak University (No. WUEC-19-068-01), on May 1, 2019. The researcher has conducted a study regarding the protection of the rights of the participants. Before collecting data, the research team clarified the sample group and those involved about the research objectives, research procedures, and the benefits gained, including protecting the right to keep personal information secret. A code is used instead of a first and last name for individual information. Research findings would be presented as an overview to improve the health of the elderly. Research data were stored in the researcher's computer and will be permanently deleted after the end of the research in 1 year. In addition,

the participants have the right to quit the program at any time without compromising the right to treatment or any benefits that have been received in the community. For the sample participating in the fall prevention program at home, the researcher has a team of village health volunteers to help them, including giving a self-care handbook at home and installing a vinyl banner showing exercise steps at home for the participants to practice accordingly.

Chapter 5. Results

Chapter 5. Results of Quantitative and Qualitative Research

Results of Quantitative Research

The study on the development of the fall prevention model for the elderly with participation in the southern community employed participatory action research to study the context and problem conditions of the community before developing a fall prevention model, to study the process of developing the model in the pilot community, to study the results of the model development and to study the success factors in the development of a fall prevention model for the elderly with participation in the pilot community. The study was conducted from May 2019 - to December 2020. In part one: Results of a Quantitative Study. The presentation is divided into two phases as follows:

Phase 1: A study on Situation of Falls among the Elderly before Development

      Section 1: Prevalence and Circumstances of Falls in the Community, Southern Thailand

      Section 2: Fall Situations among the Elderly in the Pilot Community

      Section 3: Fall Preventing Behaviors of the Elderly in the Community

Phase 2: Evaluation of the Development of a Fall Prevention Model for the Elderly in the Community

      Section 1: The Effectiveness of the Fall Prevention Program

      Section 2**:** Participants' Satisfaction with the fall prevention project

1. Phase 1: A study on Community Context and Fall Situation before the Development

1.1. Section 1: Prevalence and circumstances of falls in southern Thailand

1.1.1 General Characteristics of Participants

The sample consisted of 12,130 community-dwelling older adults with the mean age being 71.22 years (SD 8.49); the age range was 60 to 104 years. The young-old (60-69 years) represented 49.9% of the population, the medium-old (70-79 years) 31.0%, and the very old (80 years or older) 19.1%. There were slightly more females (59.8%) than males (40.2%). Almost two-thirds

(63.1%) were single or not partnered. More than two-thirds (74.3%) had primary school education, 9.3% were illiterate. The majority were Buddhist (93.8%). Half of the participants (50.4%) reported themselves as unemployed. Most participants (75.6%) lived with family members and the rest (24.4%) lived alone. Regarding biological factors, participants with vision and hearing problems were 30.2% and 18.8%, respectively, while those with impairment of balance, functional disability, and cognitive impairment were 38.6%, 10.7%, and 3.1%, respectively. About one-third (36.3%) had at least one chronic condition. Regarding behavioral factors, participants using four or more medications or using one risk drug was 35.3%. Nearly half of them (48.3%) had poorly exercised behavior. Approximately 14.2% reported that they used an assistive device when walking. Concerning home environmental factors, nearly two-thirds (66.8%) of the houses had stairs and steps without handrails or with them broken. About 32.8% had the bedroom located upstairs. Most of the toilets (73.3%) were Asian squat, and those without a grab bar 65.1%, remarkably, one-fifth (19.3%) were located outside the house. Furthermore, the hazards in general home areas with at least one risky item were approximately 43.4%.

1.1.2 Prevalence of falls among the elderly in southern Thailand

In this study, the overall prevalence of falls, defined as the percentage of respondents who experienced at least one fall within the last six months, was 12.1% for the elderly in southern Thailand. Considering the gender, the prevalence was 13.4% for women, but only 10.1% for men. The total prevalence of falls increased with age, as reported for the categories of 60-69, 70-79, and over 80 years (9.5%, 12.1%, and 18.8%, respectively).

1,467 people (12.1%) experienced at least one fall in the previous 6 months, prior to the date of the screening. Out of the participants who fell, 973 were female (8.0%) and 494 were males (4.1%). The proportion of falls was higher among females compared to males, difference statistical significance (χ^2 = 29.72, p < .001). The distribution of fall prevalence by gender is reported in Table 3 and Figure 5

Table 3 Distribution and Chi-Square analysis of falls prevalence by gender

| | Gender | | Total | χ^2 | P-value |
| | Male | Female | n (%) | | |
	n (%)	n (%)			
Fall in past 6 months	494 (4.1)	973 (8.0)	1,467 (12.1)	29.72	<.001
Non-fall in past 6 months	4,385 (36.1)	6,278 (51.8)	10.663 (87.9)		
Total	4,879 (40.2)	7,251 (59.8)	12,130 (100)		

All participants were categorized into three 10-year intervals of age group, which are 60-69 years, 70-79 years, and 80 years and above. 575 fallers (4.7%) were aged 60-69, 457 fallers (3.8%) were aged 70-79 and 435 fallers (3.6%) were aged 80 years and above. There was difference between age groups in the prevalence of falls (χ^2 =136.17, p <.001). The distribution of falls prevalence by age group is reported in Table 4 and Figure 5

Table 4.Distribution and Chi-Square analysis of falls prevalence by age group

| | 60-69 years | 70-79 years | ≥80 years | Total | χ^2 | P-value |
	n (%)	n (%)	n (%)	n (%)		
Falls	575 (4.7)	457 (3.8)	435 (3.6)	1,467 (12.1)	136.17	<.001
Non fall	5,478 (45.2)	3,305 (27.2)	1,879 (15.5)	10,663 (87.9)		
Total	6,053 (49.9)	3,763 (31.1)	2,314 (19.1)	10,230 (100)		
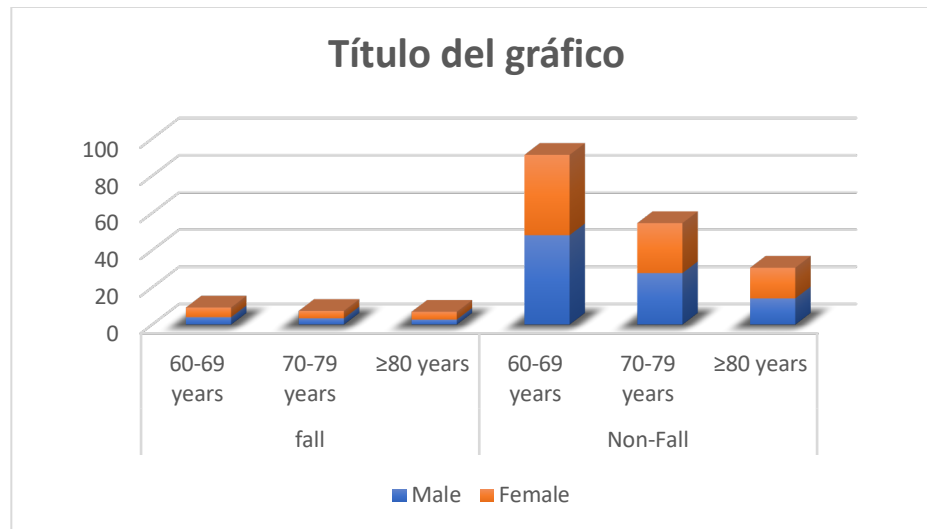
Figure 5. Distribution (percentage) of prevalence of falls by gender and age group

1.1.3 Factors associated with falls among the elderly in southern Thailand

The factors associated with falls are given in Table 5. As can be seen, the statistically significant demographic characteristics were gender, age, education level, marital status, and employed status. The health profile factors related to falls were vision impairment, hearing problems, chronic conditions, functional disability, cognitive impairment, balancing problem, medications used, inadequate exercise, and assistive device used. Additionally, the environmental factors were hazards in home areas, the toilet located outside the house, and the Asian squat toilets.

Table 5. Prevalence and characteristics of fall among Elderly in Southern Thailand (n=12,130)

Variable	Fallers n (%)	Non-fallers n (%)	Total n (%)	x^2	p
All	1,467 (12.1)	10,663 (87.9)	12,130		
Age (years): mean (*SD*)	73.67 (9.0)	70.88 (8.4)	71.22 (8.5)	t=11.901	<.001
Gender				29.72	
Male	494 (10.1)	4,384 (89.9)	4,878 (40.2)		<.001
Female	973 (13.4)	6,279 (86.6)	7,252 (59.8)		
Age				136.17	<.001
60-69	575 (9.5)	5,478 (90.5)	6,053 (49.9)		

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70-79	457 (12.1)	3,306 (87.9)	3,763 (31.0)		
≥80	435 (18.8)	1,879 (81.2)	2,314 (19.1)		
Educational level				10.51	.032
Illiterate or no formal education	140 (12.4)	988 (87.6)	1,128 (9.3)		
Primary school	1,128 (12.5)	7,883 (87.5)	9,011 (74.3)		
Secondary school and above	199 (10.0)	1,792 (90.0)	1,991 (16.4)		
Marital status				72.49	<.001
Married	689 (15.4)	3,789 (84.6)	4,478 (36.9)		
Single/Divorce/separate/widow	778 (10.2)	6,874 (89.8)	7,652 (63.1)		
Religion				.47	.789
Buddhism	1,377 (12.1)	9,999 (87.9)	11,376 (93.8)		
Islam	85 (11.7)	643 (88.3)	728 (6.0)		
Christianity	5 (19.2)	21 (80.8)	26 (0.2)		
Current employment status				134.56	<.001
Unemployed	948 (15.5)	5,168 (84.5)	6,116 (50.4)		
Employed	519 (8.6)	5,495 (91.4)	6,014 (49.6)		
Living Arrangement				1.63	.202
Living alone	338 (11.4)	2,621 (88.6)	2,959 (24.4)		
Living with others	1,129 (12.3)	8,042 (87.7)	9,171 (75.6)		
BMI (kg/m^2) mean (*SD*):	23.24 (4.1)	23.41 (4.0)	23.39 (4.0)	2.30	.513
Underweight (< 18.0)	99 (13.5)	633 (86.5)	732 (6.0)		
Normal (18-22.9)	699 (12.2)	5,050 (87.8)	5,749 (47.4)		
Overweight (≥ 23)	669 (11.8)	4,980 (88.2)	5,649 (46.5)		
Chronic conditions				15.95	<.001
No	865 (11.2)	6,857 (88.8)	7,722 (63.7)		
Yes	602 (13.7)	3,806 (86.3)	4,408 (36.3)		
Cognitive impairment				128.90	<.001
No	1,350 (11.5)	10,400 (88.5)	11,750 (96.9)		
yes	117 (30.8)	263 (69.2)	380 (3.1)		
Functional ability				355.32	<.001
Independent (ADL ≥12)	1,102 (10.2)	9,730 (89.8)	10,832 (89.3)		
Semi-dependent (ADL 5-11)	285 (29.0)	698 (71.0)	983 (8.1)		
Dependent (ADL 0-4)	80 (25.4)	235 (74.6)	315 (2.6)		
Balance problem				1119.71	<.001
No	316 (4.2)	7,134 (95.8)	7,450 (61.4)		
Yes	1,151 (24.6)	3,529 (75.4)	4,680 (38.6)		
Vision impairment				164.51	<.001
No	824 (9.7)	7,633 (90.3)	8,457 (69.7)		
Yes	643 (17.4)	3,030 (82.5)	3,673 (30.3)		

Hearing problems				175.18	<.001
No	1,005 (10.2)	8,838 (89.8)	9,843 (81.2)		
Yes	462 (20.2)	1,821 (79.8)	2,283 (18.8)		
Medications used				1079.75	<.001
No	385 (4.9)	7,462 (95.1)	7,847 (64.7)		
Yes	1,082 (25.3)	3,201 (74.7)	4,283 (35.3)		
Poorly exercise				20.09	<.001
No	678 (10.8)	5,593 (89.2)	6,271 (51.7)		
Yes	789 (13.5)	5,070 (86.5)	5,859 (48.3)		
Assistive device used				49.23	<.001
No	1,171 (11.3)	9,236 (88.7)	10,407 (85.8)		
Yes	296 (17.2)	1,427 (82.8)	1,723 (14.2)		
Hazards in home areas				696.33	<.001
No	361 (5.3)	6,507 (94.7)	6,868 (56.6)		
Yes	1,106 (21.1)	4,156 (78.9)	5,262 (43.4)		
Stairs without handrails				1.49	.224
No	508 (12.6)	3,518 (87.4)	4,026 (33.2)		
Yes	959 (11.8)	7,145 (88.2)	8,104 (66.8)		
Toilet located outside home				6.26	.012
No	1,148 (11.8)	8,547 (88.2)	9,695 (80.7)		
Yes	319 (13.1)	2,116 (86.9)	2,435 (19.3)		
Asian squat toilet				33.19	<.001
No	483 (14.9)	2,752 (85.1)	3,235 (26.7)		
Yes	984 (11.1)	7,911 (88.9)	8,895 (73.3)		
Toilet without grab bar				1.43	.231
No	533 (12.6)	3,701 (87.4)	4,234 (34.9)		
Yes	934 (11.8)	6,962 (88.2)	7,896 (65.1)		
Bedroom located upstairs				.63	.426
No	968 (11.9)	7,171 (88.1)	8,139 (67.2)		
Yes	499 (12.5)	3,492 (87.5)	3,991 (32.8)		

Notes. Bivariate associations (sociodemographic/clinical/behaviors/environment variables by fall status [fallers vs. non-fallers]): Student-test for continuous variables and the χ^2 test for categorical variables. Hazards in home: at least one of the items (dim lighting, clutter up, or slippery)

Abbreviations: ADL= Barthel Activities of Daily Living, BMI, body mass index; CI, confidence interval

The Independent Risk Factors for Falls

A summary of the multivariate logistic regression analyses is illustrated in Table 6. These results allowed us to find the significant, independent risk factors for falls in the past six months,

which belong to different categories: demographic characteristics (gender, employed status); clinical factors (semi-dependent [ADL 5-11], chronic condition, cognitive impairment, balance problems, vision impairment, and hearing problems); behavior factor (medications used, Assistive device used); environmental factors (toilet located outside the house). By contrast, the following factors were insignificant: age, marital status, educational level, insufficient exercise, hazards in home areas, and using an Asian squat toilet. We can conclude that women were 1.3 times more likely to report a fall in the past six months than men (OR: 1.3; 95% CI: 1.1-1.5). The risk of falls increased 1.7 times for individuals with functional ability in a semi-dependent group (OR: 1.8; 95% CI: 1.5-2.1). The risk of falls increased 1.7 times (OR: 1.7; 95% CI:1.3-2.3) for a person with cognitive impairment. Moreover, for balance problems, 4.7 times (OR: 4.7; 95% CI: 3.9-5.8); vision impairment, 1.2 times (OR: 1.2; 95% CI: 1.1-1.4); hearing problems, 1.2 times (OR: 1.2; 95% CI: 1.0 - 1.4); medications used, 5.1 times (OR: 5.1; 95% CI: 4.5-5.8); and an assistive device use, 1.2 times (OR: 1.2; 95% CI: 1.0-1.5). Moreover, the toilet located outside the house also increased 1.3 times the risk of falling (OR: 1.3; 95% CI: 1.1-1.5). On the other hand, employed status seemed to be a factor against falls since 20% of this group were less likely to report falls (OR: 0.8; 95% CI: 0.7-0.9), as well as chronic conditions as likely to reduce the risk of falls by 30% in multivariate analysis at OR: 0.7; 95% CI: 0.6-0.7.

Table 6. Logistic regression analysis of risk factors for falls (n=12,130)

Risk Factor	Crude OR	95% CI	*p*	Adjusted OR	95% CI	*p*
Gender (female)	1.38	1.23-1.54	<.001	1.27	1.11 - 1.46	.001
Age (years)						
70-79	1.32	1.16-1.50	<.001	1.02	.87-1.19	.800
≥80	2.21	1.93-2.52	<.001	1.01	.84 - 1.21	.939
Educational level:						
Primary school	1.01	.84 - 1.22	.92	1.01	.82 - 1.25	
Secondary school and above	.78	.62 - .99	.04	1.04	.80 - 1.35	.878
Marital status						
Single/Divorce/Separate/Widow	.62	.56 - .70	<.001	.92	.80 - 1.05	.218
Current employment status	.52	.46 - .58	<.001	.77	.67 - .88	<.001
Functional ability						
ADL 5-11	3.61	3.11 - 4.19	<.001	1.75	1.44 - 2.11	<.001

	OR	CI	p	OR	CI	p
ADL 1-4	3.01	2.31 - 3.90	<.001	.97	.69 - 1.35	.837
Chronic medical conditions	1.25	1.12 - 1.40	<.001	.67	.59 - .78	<.001
Cognitive impairment	3.43	2.32 - 3.90	<.001	1.69	1.26 - 2.25	<.001
Balance problems	7.36	6.46 - 8.39	<.001	4.74	3.86 - 5.81	<.001
Vision impairment	1.95	1.75 - 2.19	<.001	1.23	1.06 - 1.42	.006
Hearing problems	2.23	1.97 - 2.52	<.001	1.21	1.02 - 1.43	.025
Medications used	6.26	5.27 - 6.45	<.001	5.10	4.45 - 5.83	<.001
Poorly exercises	1.28	1.15 - 1.43	<.001	.99	.87 - 1.13	.905
Assistive device used	1.64	1.43 - 1.88	<.001	1.23	1.04 - 1.45	.015
Hazards in home areas	4.80	4.23 - 5.44	<.001	1.12	.91 - 1.38	<.289
Toilet located outside	1.19	1.04 - 1.36	.012	1.31	1.11 - 1.53	.001
Asian squat toilet	.71	.63 - .78	<.001	.91	.79 - 1.04	.160

Note: (reference groups: Male, 60-69 years old, Illiterate, Married, Unemployed, ADL ≥12)

OR = odds ratio; CI = confidence interval

1.2 Section 2: The Situation of Falls in the Pilot Community

1.2.1 The Prevalence of Falls in Sa Kaew Sub-district

From a survey of 350 elderly in Sa Kaew sub-district, 337 participants have completed data with the following details:

1) General Characteristics

Most of the participants were female or 77.7%. The average age was 77.8 years old. 30.3% were youngest-old (60-69 years), 39.8% were middle-old (70-79 years), and 30.0 were oldest-old (≥80 years). The older adults were married for 49.0%, 83.1 had primary education. 71.8% had average family earnings between 1,001-5,000 baht. 82.0 percent lived with other members, such as spouses and children. 18.0 percent of the elderly lived alone. 43.0% had no jobs. The elderly had important congenital diseases, namely high blood pressure 54.0%, osteoarthritis 29.1%, urinary incontinence 19.6%, diabetes 19.6%, and cardiovascular disease 6.8%, using more than 4 types of medication or at least one type of medication with psychotic effects 54.9%. 17.5% of the elderly were at risk of dementia. Most of them were able to help themselves (ADL ≥12) by 85.2%. From the fall risk assessment by Thai-FRAT, 38.4% were at high risk of falls (risk score ≥4 scores). 20.8% had a fall history in the past 6 months, and 20.2% had a fear of falls, as showed in Table 7.

Table 7. General Characteristics of the Samples (n=337)

Characteristics	N	%
Gender		
Male	75	22.3
Female	262	77.7
Age (year) min-max =60-96 Mean = 77.71, S.D. = 51.02		
60-69	102	30.2
70-79	134	39.8
≥80	101	30.0
Status		
Single/separate/ widowed/divorced	172	51.0
Married/Couple	165	49.0
Education level		
illiterate	24	7.1
primary school	280	83.1
Secondary school or higher	33	9.8
occupation		
no career	145	43.0
trade	11	3.3
agriculture	144	42.7
other	37	11.0
Monthly income (Baht)		
under 1000	56	16.6
1,001-5,000	242	71.8
5,0001-10,000	21	6.2
more than 10,000	18	5.3
Living Arrangement		
Living with spouse or children	309	82.0
Living alone	68	18.0
Member of elderly club		
No	177	52.5
Yes	160	47.5
Taking medicine ≥4 or 1 drug with psychoactive effects		
No	152	45.1
Yes	185	54.9
Alcohol consumption		
No	276	81.9
Yes	61	18.1
Inappropriate shoes		
No	136	40.4
Yes	201	59.6
Activities of Daily Living: ADL		

ADL 0-4	6	1.8
ADL 5-11	11	3.3
ADL ≥12	320	95.0
Medical problems		
Hypertension	182	54.0
Diabetes	66	19.6
Osteoarthritis	98	29.1
Cardiovascular disease	23	6.8
Urinary incontinence	66	19.6
Risk to falls (Thai FRAT ≥4 scores)	129	38.3
Risk to dementia	59	17.5
Fear of falling	68	20.2
History of falls in the past 6 months	70	20.8

The home environment survey found that 74.8% had no handrails on stairs and in bathrooms, 37.1% were squat toilets, and 36.8% of floors had a different level. In addition, 25.8% of floors in the house were wet and slippery, 24.6% had stuff cluttered, and 27.6% had uneven floors and holes, as shown in Table 8

Table 8. Characteristics of housing environment

Characteristics	N	%
Insufficient lighting	55	16.3
Place clutter	83	24.6
The bedroom is upstairs	34	10.1
Different floor levels	124	36.8
Uneven floor	63	18.7
Wet/slippery/wet floor	87	25.8
stairs/bathrooms without handrails	252	74.8
Asian squat toilet	125	37.1
Bathroom/toilet is outside the house.	37	11.0
The floor outside the house is uneven	93	27.6

1.2.2 The Incidence of Falls among the Elderly in the Pilot Community

In the past six months, 20.8% of the 337 participants had fallen. 58.6% were females. 67.1% fell inside the house. The incidence of falls was mostly during the day (08.00-15.59), 50.0%, followed by the evening (16.00-18.59), 27.1%. Most cases were caused by tripping over cluttered

objects (75.7%), followed by slipping from wet areas (40.0%), post-fall injuries (62.9%), and severe injuries requiring hospitalization (12.9%) as show in Table 9.

Table 9. Percentage distribution of fall circumstances by gender and age group

Fall incidence	Total	Percent
Fell in the past six months		
No	267	79.2
yes	70	20.8
Female	41	58.6
Causes of falls		
Stumbled a cluttered thing	53	75.7
slip from wet floor	16	22.9
Stumbled on edges	17	24.3
Falling into a hole in the road	9	12.9
Dizziness	6	8.6
Limb weakness	12	17.1
Loss of balance	12	17.1
Falling area		
outside home	23	32.9
inside home	47	67.1
Period time of falling		
Morning	15	21.4
Noon	35	50.0
Evening	19	27.1
Night	16	22.9
Injury after fall	44	62.9
Hospitalized	9	12.9

1.3 Section 3. Fall Preventing Behaviors of the Elderly in the Pilot Community

The fall prevention behaviors in the elderly can be presented in 2 parts: 2 aspects of fall prevention behaviors in the elderly (i.e., internal, and external factors), and the level of self-care behaviors to prevent falls of the elderly as the following details:

1.3.1 Fall prevention behaviors of the elderly

The top 3 routine-practiced behaviors were 1) they do not drink alcohol, 96.8% 2) followed by 84.1% of those when feeling dizzy, they stopped doing activities immediately and 3) when feeling a loss of balance will stop the movement and find a stable anchorage of 78.3%.

For the sometimes-practiced behaviors, the top 3 were: 1) taking calcium-rich foods such as milk and small fish strengthens bones by 52.8% 2) followed by wearing appropriate shoes accounting for 37.7% 3) 36.8 percent were careful about the light inside and around the house day and night.

For behaviors that did not practice at all, the top three were 1) regular exercise at least three times a week by 53.7% 2) visiting a doctor for a checkup when you have vision problems by 41.5%, and 3) visiting the doctor for an annual physical examination by 24.6%, respectively, as shown in Table 10.

Table 10. Fall prevention behaviors among older adults in the community

Item	Fall prevention behaviors	Routine N (%)	Sometime N (%)	Never N (%)	$\bar{x}$	S.D.	Level
	About internal factors						
1	When you feel unbalanced, you stop moving and find a stable anchorage.	264 (78.3)	64 (19.0)	9 (2.7)	2.73	0.52	high
2	Careful about doing activities both inside and outside the home.	235 (69.7)	100 (29.6)	2 (0.7)	2.70	0.54	high
3	When feeling dizzy, you stop doing activities immediately.	283 (84.1)	47 (13.9)	7 (2.0)	2.80	0.48	high
4	Regular exercise for 30 minutes at least three times a week.	54 (16.0)	103 (30.3)	181 (53.7)	1.63	0.77	low
5	You will see your doctor for a checkup when you have vision problems.	156 (46.3)	41 (12.2)	140 (41.5)	2.07	0.94	moderate
6	Visiting the doctor for an annual physical examination.	164 (48.7)	90 (26.7)	83 (24.6)	2.27	0.83	moderate
7	Taking calcium-rich foods such as milk and small fish to strengthen bones.	126 (37.4)	178 (52.8)	33 (9.8)	2.43	0.68	high
8	Do not drink alcohol.	326 (96.8)	9 (2.8)	2 (0.4)	2.87	0.43	high

9	Take the medication as your doctor prescribed, do not stop, or adjust the dose yourself.	222 (65.9)	91 (26.9)	24 (7.2)	2.53	0.68	high
10	Standing up or moving Slowly, with confidence, not in a hurry	211 (62.9)	119 (35.3)	6 (1.8)	2.53	0.63	high
	About external factors						
11	Wear clothes that fit and are not too long.	250 (74.2)	80 (23.7)	7 (2.1)	2.70	0.54	high
12	Check up on the stability of the furniture, such as tables, chairs, and beds.	233 (69.1)	97 (28.8)	7 (2.1)	2.60	0.62	high
13	When you find the floor wet, you will hurry to dry it immediately.	249 (73.9)	68 (20.2)	20 (5.9)	2.67	0.61	high
14	The light inside and around the house is sufficient both day and night.	210 (62.3)	124 (36.8)	3 (0.9)	2.57	0.57	high
15	Lights are turned on at night to provide adequate lighting in bathrooms and paths.	213 (63.2)	101 (30.0)	23 (6.8)	2.57	0.63	high
16	You do not wear socks while walking inside the house.	233 (69.1)	97 (28.8)	7 (2.1)	2.60	0.62	high
17	You and your family help arrange the items in the house orderly without obstacles.	221 (65.6)	114 (33.8)	2 (0.6)	2.60	0.56	high
18	When walking and moving, you always look at the ground first.	221 (65.6)	110 (32.6)	6 (1.8)	2.50	0.57	high
19	You walk carefully or avoid cross-level walkways, rough floors, or slippery wet floors.	211 (62.6)	119 (35.3)	7 (2.1)	2.53	0.63	high
20	As you go up and down the stairs, you always use your hand to hold at least one handrail on either side.	221 (65.6)	101 (30.0)	15 (4.4)	2.57	0.62	high
21	When using the bathroom, or toilet, you will hold the handrail or handle.	191 (56.7)	95 (28.2)	51 (15.1)	2.40	0.77	high
22	Using stable chairs or stairs when picking up things above eye level.	248 (73.6)	68 (20.2)	21 (6.2)	2.67	0.60	high
23	Wearing appropriate shoes	186 (55.2)	127 (37.7)	24 (7.1)	2.50	0.63	high
24	Do not allow pets to run and play in the house.	209 (62.1)	91 (26.8)	37 (11.1)	2.53	0.68	high
25	Avoid lifting large object or many objects.	223 (66.2)	102 (30.3	12 (3.5)	2.63	0.56	high
	Total				2.40	0.53	high

We found a minimum score of 35 points and a maximum score of 54 points, a mean score of 46.37 points, and a standard deviation of 6.79. When classifying behavior into three levels using the mean score and standard deviation, the overall level of fall prevention behavior of the elderly was as follows:

> 53.0 score   means   a high level

40.0 - 52.0 score   means   a moderate level.

≤ 39 score   means   a low level

The elderly had Fall preventive behaviors at a high level of 40.0 %, followed by a low level of 33.3% and a moderate level of 26.7%, as shown in Table 11.

Table 11. The Level of Behavior on Fall Prevention (n=337)

Behavior	Level of Behavior			$\bar{x}$	S.D.
	Low	Moderate	High		
	n (%)	n (%)	n (%)		
Behavior in the elderly	112 (33.3)	90 (26.7)	135 (40.0)	46.37	6.79

2. Phase 2 The Development of a Fall Prevention Model

The results of the development model, there are two parts as follows:

2.1 Section 1: The Effectiveness of the Fall Prevention Program for the Elderly in the Community

The home-based fall prevention program for the elderly developed with a one-group pretest-posttest design with 30 older adults in high-risk groups for 16 weeks had results as follows:

Characteristics of the sample: There were 30 participants. Most of them were female (93.3%). The mean age was 71.8 years old. 76.7 percent completed primary school, and most of them are married. Most of them had congenital diseases, especially chronic diseases (97.0%), and had to take medication regularly (76.7%). They had eye problems (26.7%) and problems with gait and balance (46.7%). Most of them do not use assistive devices (90.0%). They had a history of falls at least once in the past six months (46.7%) and a history of repeated falls (26.7%). In

addition, they had a history of falls in the house (16.7%). The areas of falls included a bathroom, a bedroom, and stairs, while they fell outside the home (7.8%) (Shown in Table 4).

Environment: Most participants had several environmental risk factors. For example, 16.6% of the houses were two-floor. 10.0% had bedrooms upstairs, and 43.3% of dwellings had stairs without handrails/ or there were unstable handrails and found cluttered things on the stairs of 63.3%. 43.3 percent had insufficient lighting. There were squat toilets for 40.0%, 63.3% without bars, and 43.3% were wet and slippery floors in a bathroom. In addition, 16.7% had insufficient light in a bathroom, and 36.7% had insufficient light in the corridors to a bathroom. 13.3% had rough, slippery, and wet floors around the house. 16.7% had shelves at a level that was not easily reachable. 30.0% had carpets made from rags or old clothes, as shown in Table 12.

Table 12. Characteristics of General Information of the Participants in the Program (n=30)

Characteristics	N	%
Gender		
Male	2	6.7
Female	28	93.3
Age (year) mean 71.84, S.D. = 51.02, min-max =60-84		
60-69	13	43.3
70-79	14	46.7
≥80	3	10.0
Education level		
Primary school	23	76.7
Secondary or more	17	23.3
Disease		
Hypertension	13	43.3
Diabetes	2	6.6
Cardiovascular disease	2	6.6
Bone and joint	10	33.3
Urinary incontinence	2	6.6
No disease	3	10.0
The primary caregiver		
Couple	14	46.7
Children/others in the family	16	53.3
Have a vision problem	8	26.7
Have daily medication	23	76.7
Have gait and balance problem	14	46.7
Using assistive devices	3	10.0
Wearing appropriate shoes	2	6.7

At least 1 fall in 6 months		14	46.7
History of repeated falls		8	26.7
Environmental risks			
two-storey house		3	10.0
bedrooms upstairs		3	10.0
Stairs without handrails/ nonstable/with cluttered things		13	43.3
Have door threshold		19	63.3
insufficient lighting inside the house		13	43.3
Asian squat toilets		12	40.0
The bathroom without bars		19	63.3
wet and slippery floors in a bathroom		13	43.3
Insufficient lighting in the corridors to a bathroom		11	36.7
On the floor has carpets made from rags or old clothes		9	30.0
Shelves level are not easily accessible.		5	16.7
Around the house are rough, slippery, and wet		4	13.3

The effectiveness of the program was tested by observing changes in balancing (by TUG test), leg muscle strength (by 30-second chair stand), standing balance (4-stage balance test), assessment of fall prevention behavior, and satisfaction questionnaire towards the program.

From Table 13, after the program, participants demonstrated better balance. From the TUG test before the program, participants had time to balance less than 13.50s for seven people (23.3%), 13.50-19.99s for 19 people (63.3%), and more than 20s for four people (13.3%). In contrast, after the program, they had time to balance less than 13.50s increasing to 23 people (76.7%), 13.50-19.99s decreasing to 7 people (23.3%), and no people using the time to balance more than 20s.

Table 13. The Balance Time by TUG Test Before and After the Program (n=30)

Balance Time (second)	Before		After	
	n =30	%	n =30	%
<13.50	7	23.3	23	76.7
13.50 – 19.99	19	63.3	7	23.3
≥ 20	4	13.3	0	0

From Table 14, the lower muscle strength test comparing the number of times in the 30-second chair stand found that participants had an increased average number of times in the 30-

second chair stand after the program. Before the program, they had an average of 8.9 times; after the program, it increased to 13.2 times, meaning that the exercise program for fall prevention caused the elderly to have better lower muscle strength.

Table 14. Mean Scores of 30-second Chair Stand Before and After the Program (n=30)

the lower muscle strength test 30 second chair stand (time)	Before			After		
	Min-max	$\bar{x}$	S.D.	Min-max	$\bar{x}$	S.D.
	4-12	8.9	1.9	9-16	13.2	1.4

From Table 15, the 4-stage balance test found that after the program, participants had a statistically significant improvement in their balance at .05 from 5 people (16.7%) to 13 people (43.3%). The group who could stand with support before the program included 20 people (66.6%); after the program, it was reduced to only 17 people (56.7%). 5 people, who could not stand, could stand with support after the program.

Table 15. The Comparison of Balance Ability of the Participants Before and After the Program

The 4-stage balance	Before	After	χ^2	p
	n (%)	n (%)		
Cannot stand	5 (16.7)	0 (0)	7.27	.026
Can stand with support	20 (66.6)	17 (56.7)		
Can stand without support	5 (16.7)	13 (43.3)		

From Table 16, participants' mean scores for fall prevention behavior changed better in all items after the program.

Table 16. Mean Scores for Fall Prevention Behavior Before and After the Program (n=30)

Fall Prevention Behavior	Before		After	
	$\bar{x}$	S.D.	$\bar{x}$	S.D.
1. When you feel unbalanced, you stop moving and find a stable anchorage.	2.27	.45	2.53	.51
2. Careful about doing activities both inside and outside the home.	2.00	.64	2.53	.51
3. When feeling dizzy, you stop doing activities immediately.	1.83	.53	2.43	.50
4. Regular exercise for 30 minutes at least three times a week.	1.73	.52	2.70	.47
5. You will see your doctor for a checkup when you have vision problems.	1.83	.38	2.23	.43
6. Visiting the doctor for an annual physical examination.	1.77	.51	2.73	.45
7. Taking calcium-rich foods such as milk and small fish to strengthen bones.	1.37	.49	2.33	.48

8. Do not drink alcohol.	1.53	.51	2.07	.25
9. Take the medication as your doctor prescribed, do not stop, or adjust the dose yourself.	1.90	.55	2.57	.50
10. Standing up or moving Slowly, with confidence, not in a hurry	2.47	.57	2.83	.38
11. Wear clothes that fit and are not too long.	1.57	.57	2.43	.50
12. Check up on the stability of the furniture, such as tables, chairs, and beds.	2.07	.37	2.60	.50
13. When you find the floor wet, you will hurry to dry it immediately.	1.97	.18	2.27	.45
14. The light inside and around the house is sufficient both day and night.	1.57	.57	2.47	.51
15. Lights are turned on at night to provide adequate lighting in bathrooms and paths.	1.47	.57	2.33	.48
16. You do not wear socks while walking inside the house.	1.57	.50	2.47	.51
17. You and your family help arrange the items in the house orderly without obstacles.	1.60	.50	2.73	.45
18. When walking and moving, you always look at the ground first.	1.80	.49	2.37	.49
19. You walk carefully or avoid cross-level walkways, rough floors, or slippery wet floors.	2.17	.38	2.90	.31
20. As you go up and down the stairs, you always use your hand to hold at least one handrail on either side.	2.47	.51	2.83	.38
21. When using the bathroom, or toilet, you will hold the handrail or handle.	2.17	.46	2.67	.48
22. Using stable chairs or stairs when picking up things above eye level.	2.17	.53	2.57	.50
23. Wearing appropriate shoes	2.10	.55	2.33	.48
24. Do not allow pets to run and play in the house.	2.07	.37	2.77	.43
25. Avoid lifting large object or many objects.	2.07	.52	2.50	.51
Total	1.90	.51	2.11	.42

Table 17 compares the mean scores of balance time, muscle strength, and the mean score for fall prevention behavior before and after the program. The mean scores of all three variables after the program improved with a statistical significance of <.001.

Table 17. The Comparison of Mean Scores for Balance Time, Muscle Strength, and Fall Prevention Behavior Before and After the Program (n = 30)

variable	Before			After			t	p
	Min-max	$\bar{x}$	S.D.	Min-max	$\bar{x}$	S.D.		
Balance time	12.0-31.0	15.8	4.12	10-16	12.62	1.42	5.43	<.001
Lower muscle strength	4-12	8.9	1.90	9-16	13.21	1.78	-10.95	<.001
Fall preventive behaviors	1-3	1.90	.31	2-3	2.52	.21	-12.09	<.001

The results of individual multifactorial management: During home visits, the two elders were referred to consult with a doctor to modify medication that had psychotropic effects, totaling two elders to consult with a physical therapist on the use of walking aids and two houses to consult on building handrails to practice walking. Five homes with high-risk need to improve, 4 of which received cooperation from their families, and one house needed help from the village's fund. Some risky homes that could modify with cooperation from relatives included 12 cases of slippery areas, 9 cases of bathroom handrails, and 2 cases of handrails on stairs. For individual multifactorial management, a report was sent to the Sub-district Health Promoting Hospital for continuous care for all patients.

2.2. Section 2: Satisfaction toward the Fall Prevention program

From the satisfaction survey on the development of a fall prevention program for the elderly in the community, including 20 stakeholders in elderly care and 30 participants in the fall prevention program, the mean level of overall satisfaction toward the activities was at a high level, with overage scores of 4.20. The results showed that the participants' satisfaction was the highest in the appropriateness of media used for self-exercise training and the follow-up support of the village health volunteers in the neighborhood, with average scores of 4.30 and 4.25, respectively. However, the satisfaction with the lowest average score of 4.0 was the appropriateness of the project formulation and obtaining information about the risk of falling yourself, as detailed in Table 18.

Table 18. Participants' Satisfaction with the fall prevention project (N= 50)

	Assessment topic	$\bar{x}$	S.D.
1	Recognizing information about the project	4.05	.51
2	Appropriateness of the project formulation	4.00	.46
3	Obtaining information about the risk of falling yourself	4.00	.32
4	Obtaining information on actions to prevent falls	4.05	.39
5	Educating the speakers in the project	4.05	.61
6	Opportunity to ask questions or participate in activities	4.20	.41
7	Appropriateness of media used for self-exercise training	4.30	.47
8	Follow-up support of the village health volunteers in the neighborhood	4.25	.55
9	The knowledge gained from the project can be put into practice	4.05	.51
10	Your satisfaction with the overall project	4.20	.41

Results of Qualitative Study

The study on the development of the fall prevention model for the elderly with participation in the southern community employed participatory action research to study the context and problem conditions of the community before developing a fall prevention model, to study the process of developing the model in the pilot community, to study the results of the model development and to study the success factors in the development of a fall prevention model for the elderly with participation in the pilot community. The study was conducted from May 2019 - to December 2020. In part one: Results of a qualitative study on community-based fall prevention in the elderly. The presentation is divided into three phases as follows:

Phase 1: A study on Context and Situation of Falls among the Elderly before Development

Section 1: Fall Prevention Measures in Thai Communities, and Current Operational Problems.

Section 2: Community Context and Fall Situations among the Elderly in the Pilot Community

Section 3: Perception of Falls among the Elderly and Stakeholders in the Pilot Community

Phase 2: The Development of a Fall Prevention Model for the Elderly in the Community

Section 1: The Participatory Meeting to Plan and Develop a Fall Prevention Model

Section 2: Results from the Process of Developing a Fall Prevention Model

Section 3: Result of Fall Prevention Model for the Elderly in the Pilot Community

Phase 3: Evaluation

Section 1: Lessons Learned on Developed Fall Prevention Model in the Pilot Community

Section 2: Lessons Learned on the Development of Falls Prevention Model

1. Phase 1: A study on Context and Situation of Falls among the Elderly before Development

1.1. Section 1: Fall Prevention Measures and Current Operational Problems in Communities

1.1.1. The measures of elderly care in Thai communities

Characteristics of elderly care in Thai communities are as follows:

1) A caring by family: The caring and attention are provided by the family with holistic care, including home safety, illness care, medical treatment, and mental care. In addition, this type of caring includes food, clothing, safe, etc. Data from the survey found that 75.6% of the elderly live with their family.

2) A caring by organization in community

Local Administrative Organizations have supported the budget for older people, such as work promotion, building a fitness ground in communities, and the establishment of elderly clubs in every village promoting the socially addicted elderly to participate in activities and increase their life skills, and participate in social activities, such as exercise activities, field trips, cooking, etc., as well as supporting long-term care project budgets for them.

3) A caring by a community network

3.1) Village Health Volunteers (VHVs), the person which perform tasks assigned by the staff of the Sub-District health-promoting hospitals, are responsible for their villages with three main functions, namely, providing primary care services, first aid by common home remedies, and using folk wisdom, such as massage or herbs to solve health problems. Proactive actions include screening for diseases such as diabetes, high blood pressure, etc. Moreover, currently, all sub-districts have trained volunteer caregivers for a long-term care project, resulting in more effective care for the bedridden elderly.

3.2) Community leaders who support various activities in the community, including village headmen, Sub-District headmen, occupational groups, housekeeper groups, and leaders of the elderly club.

4) A caring by relevant sectors

Sub-District Health Promoting Hospital, prioritizing the overall health care of the elderly. Health promotion includes disease prevention, primary treatment, and health rehabilitation. In addition, Sub-District Administrative Organization provided budget support for various projects to improve the quality of life for the elderly in communities.

The collection of spatial data from documents in the community revealed the following details:

1) The policies and guidelines for preventing falls in 20 communities found that implementing procedures appears to be a top-down approach. Moreover, each area received a policy and guideline from different provincial departments. Some coordinate with work groups in orthopedics, and some with the nursing department in the hospital. Some are affiliated with social medicine groups. In addition, the operating guidelines in each area are different. For example, some operate according to the Bureau of Non-Communicable Diseases guidelines. Some implement following the Department of Medical Services standards for quality geriatric clinics, Ministry of Public Health. Some operate under the International Patient Safety Goals (IPSG).

As for the coordination between the provincial public health office that determines the policy and the local administrative organization that owns the budget for activities in the community, there are still gaps in contact.

1.1.3 Fall prevention measures for the elderly in the Thai community

The informants consist of the administrators of Sub-district Health-Promoting Hospitals (SHPH), or the executives of Subdistrict Administrative Organizations (SAO), totaling 20 people. They participated in the focus group discussion (FGD), and 15 people (75%) were invited to the in-depth interview (IDI) on fall prevention measures in 20 communities and current operational problems. The IDI and FGD showed that the community′s fall prevention measure was unclear. However, there are guidelines for elderly care regarding fall prevention as follows:

1.1.3.1 Annual health screening and assessment for older people

Sub-District health promoting hospitals performed health screening and assessment under the guidelines of the Ministry of Public Health (2018), which consists of screening for chronic non-communicable diseases (diabetes and hypertension), eye health, dementia, oral health, depression, osteoarthritis, and ability to perform daily activities (Bethel Activity of Daily Living

(ADL). In addition, the screening includes the Timed Up and Go Test (TUG) and the question of the fall history in six-month. Still, it was found that the officials did not solve problems for a risk group with balance problems (TUG≥12 seconds or fall history) and did not report to elders' people and their families about the assessment result. Therefore, there were no plan to implement a fall prevention program in communities.

1.1.2. The long-term care project for older people

In 20 sub-districts, the executives gave the same information that the Sub-District Administrative Organization initiated a long-term care program for the elderly according to the policy of the Ministry of Public Health and the National Health Security Office by providing an annual long-term caregiver training in the Sub-District covering the Typology of Aged with Illustration (TIA) when the ADL was less than 12. There is a home visiting for caring the bedridden elders by a multidisciplinary team from hospitals and the sub-district health promoting hospitals. However, a community still do not plan to prevent an increased number of bedridden elders that may occur from accidental falls which is the main issue.

1.1.3 Establish and support activities in elderly clubs

In 20 sub-districts, the executives gave the same information that elderly clubs received support from the Subdistrict Administrative Organization and the Subdistrict Health Promoting Hospital. The clubs are important to encourage the elderly to participate in social activities and promote physical and mental health, such as exercise, a merit ceremony, and field trips. However, it was found that some elderly people did not participate in the activities due to travel and health limitations.

1.1.4 The current patterns of preventing falls among Thai elderly in the community

Most of the informants illustrate that there were patterns of preventing falls among the Thai elderly in the community that can be summarized in two major approaches as follows:

1) Patterns of preventing falls by the elderly themselves include increasing caution in movement and exercising to improve muscle strength. Organize the home environment inside and outside the house appropriately. Including, learning about self-care to prevent falls in the context of local culture.

2) Fall prevention measures related to stakeholders in elderly care including:

(1) Public health agencies and other related agencies, including the sub-district health-promoting hospital, district hospital, and provincial public health. In terms of screening and assessing the risk of falls. In addition, also advises promoting knowledge on fall prevention for the elderly in the community.

(2) In the role of the local government, supporting the budget for the maintenance of road conditions and adequate lighting. It also supports the involved project, such as a safe environment project and the project to develop the leadership potential of the Village health volunteers in elderly care.

(3) In the role of community leaders, such as village headmen supporting the campaigning in the community, and village health volunteers supporting health screening and monitoring.

1.1.5. The problem with implementations of preventing falls in the Community

The group discussion found that the majority of communities had difficulties in their implementations as follows:

1) There was minor support for fall prevention for the elderly from internal and external agencies.

2) Most community leaders still lack knowledge and understanding of fall prevention in the elderly. So, there is no policy and fall preventive measurement in the community. As a result, the responsible personnel in the community cannot provide assistance or full advice.

3) They did not understand relevant budget disbursement regulations and other funding sources in implementing the program to prevent falls for the elderly, especially using the budget for home environment improvement.

4) The attitudes of some groups of the elderly were not compatible with the activities organized. Therefore, they ignore participating in the activities.

1.2. Section 2: Community Context and the situation of Fall in Elderly in the Pilot Community

1.2.1 Community Context

Location: Sa Kaew Sub-district is located at 13 kilometers away from Tha Sala District Office and 50 kilometers away from the province center.

Landscape: It is a flat area as a source of rainwater and waterlogging in some areas during the rainy season, and agriculture is a main career with a rural settlement.

Transportation: There is road access to all villages. Most of the roads are reinforced concrete and the main road is a paved road, connecting to many Asian Highway Networks and other communities with ease, such as traveling from home to the hospital. If the hospital has no bus, it opts for a private car or motorcycle, or a taxi.

Population: The Sa Kaew Sub-District Administrative Organization consists of 11 villages with a population of 9,283 people and 1,740 households. The number of people 60 years old and above is 1,712 people, with a population of the elderly in Sa Kaew sub-district, divided by villages as shown in the table 19.

Table 19. Proportion of the Elderly in Sa Kaew Sub-District Living in 11 Villages

Village	Population		
	Male	Female	Total
1	82	95	177
2	65	92	157
3	80	110	190
4	35	66	101
5	71	123	194
6	72	84	156
7	91	126	217
8	52	75	127

9	63	96	159
10	40	76	116
11	65	53	118

Economic Status of the Elderly: It was found that 39.1% of the elderly did not have jobs. 98.2% of the elderly still had earnings from agriculture. 87.4% of them had sufficient earnings to cover their expenses.

Culture: Locals live a rural lifestyle with mutual assistance in the community. Interesting traditions include giving merit in winter, Songkran Festival, the Festival of the Tenth Lunar Month, the End of Buddhist Lent Day, and ceremonies related to marriage and the Naga ordination ceremony.

Major Places: 1) 7 primary schools, 2) 1 secondary school, 3) 5 pre-school child development centers, 4) 2 reading newspapers places/public libraries, 5) 7 temples/monasteries, 6) 2 Sub-District health promoting hospitals, and 7) 1 police station.

Community Health Services: There are two public health services in the Sa Kaew sub-district, namely Ban Sanguan Health Promoting Hospital and Ban Huakhu Health Promoting Hospital, which provide essential health services as well as a public service clinic for initial disease treatment, a chronic disease clinic, and health promotion services and disease prevention in the community. The Sakae Sub-District Administrative Organization provides a budget for promoting and preventing health problems in the community as well as public utilities and the environment in the community.

Community Cooperation: The researcher noticed that the community portrayed good coordination in organizing activities in the community and developing the environment. It can be a model for many sub-districts in Nakhon Si Thammarat. From interviews with community leaders, the community was ready to support measures to prevent falls for the elderly but still lacked knowledge and guidelines.

Community Resources: From interviews with participants, the community had community resources consist of human resources, places, service system as follows:

1) Human resources: Social capital with comprehensive potential along with a strong leadership network in driving elderly care projects in the community talented and

influential people: include 11 village headmen, the president of the Sa Kaew Sub-District Administrative Organization (1) and Permanent Secretary of Sa Kaew Sub-District Administrative Organization (1), Sa Kaew Sub-District headmen (1), leaders of village health volunteers in 11 villages (11), chairman of the Aerobic Club (1), the president of the Elderly Club (11 clubs), Women's Group (2 groups) and nurses of Ban Hua Khu Health Promoting Hospital (2).

2) Groups, learning sources, and community organizations: elderly clubs, Sub-District women groups, and aerobic clubs in every village.

3) Public and private organizations: include Ban Hua Khu Health Promoting Hospital, Ban San Guan Health Promoting Hospital, Tha Sala Hospital, Tha Sala District Public Health, and Sa Kaew Sub-District Administrative Organization.

4) Public places: include exercise grounds in all villages, Sub-District multipurpose pavilions, and Sa Kaew Temple.

1.2.2 Environment in Community Affecting Falls among the Elderly

The community environment includes public areas regularly involved in activities for the elderly in the community. It is found frequently in 5 prominent places: roads within the community, temples, Sub-District health-promoting hospitals, the Sub-District Administrative Organization office, and the market, with the following details:

1) Roads within the community: There are paved roads, reinforced concrete roads, paving stone roads, and gravel roads that connect around the village and make transportation convenient. However, all the roads had no footpath. The curb is ground, and some parts are rough. On the road, there is no light. Most of the elderly left their homes to do community activities on foot, using bicycles, motorcycles, and cars. They go alone and with their relatives.

2) Temples: In this community, there are two temples; Wat Sa Kaew temple is the main temple. Both temples have places for religious ceremonies, contributing to making merit for the elderly. Moreover, the dharma practice pavilion is a one-floor, not a high platform. However, there are not enough standard toilets for the elderly and the disabled.

3) Sub-District Health Promoting Hospitals: there are two hospitals, and both places have the same building structure; a 2-floor building that provides health care services in the first-floor area. The first floor is not raised from the ground, and the floor is glazed tile. There are toilets for the elderly and the disabled. However, it is not convenient since the toilets are located at the back of the building with a narrow door, so a wheelchair cannot get through.

4) Sa Kaew Sub-District Administrative Organization Office: This place where the elderly often uses for various benefits. The Office building has 2-floors with stairs and railings at the front and a concrete path around the building to walk easily. A multipurpose hall is raised to the same height as the office building with wide stairs and handrails. There are two toilets located behind the building. Moreover, there is also a one-floor hall with ramps for the elderly and the disabled to walk safely.

5) Community market: The elderly often visits to buy things. The place looks like a vast courtyard, but the messy placement of items creates a chance for stumbling and falling easily

1.2.3 The Home Environment Related to Falls in the elderly

From the survey of the elderly's home environment, some environments were at risk and can cause falls as follows:

1) The floor was slippery. In some houses, the floor was paved with glazed tiles, and some were cement. So, when the floor is wet, it will be slippery, making it easier to fall.

2) The floor's level varied. most of the elderly's houses had different levels of floor and no color bands warning a level difference, but the elderly would argue that "they are used to it since it's been around for decades." But the elderly with vision impairment or balance problems due to muscle weakness in the legs or having short strides and raising feet at a low level, the elderly will stumble and fall when there are obstacles.

3) Stairs without handrails. A survey of the elderly's homes found that 74.8% of homes with stairs without stable handrails cause a fall. Since the problem of older people is mistaken steps, poor balance due to insufficient leg muscles, or slipping from stepping on the doormat around the stairs.

4) Bathrooms are not standardized, such as squat toilets. The bathroom floor is slippery due to moss or soap stains. In addition, the bathroom there was without handrails, which found 37.1%.

5) Objects or furniture in the house blocks the corridor. According to the survey, furniture for decoration, such as large tables and chairs, is placed all over the area. As a result, the elderly may stumble and fall easily.

6) There were wires, power sockets, or others that were cluttered. For example, some elderly put old rags on the floor, which may cause slipping or tripping easily.

7) Most households have pets, such as dogs or cats. Pets play with the elderly as they walk and can cause falls.

1.2.4 Problems in Implementing Fall Prevention Measures for the Elderly

The Sa Kaew Sub-District has a population of 1,712 older people, accounting for 18.44 percent of the total population. Older adults were in dependency (ADL<12) for 14.8 percent. In addition, 29.1% had knee osteoarthritis, and the group was at high risk of falling (Risk score ≥ 4 scores) 38.3%. People with a fall history in the past six months were 20.8%, and people had a fear of falls for 20.2%.

Based on in-depth interviews with Sa Kaew Sub-District Administrative Organization executives, relevant staff, and health volunteers. There are some problems with implementing fall prevention measures as follows:

1) the Sub-district health-promoting hospital, a primary care health service unit, had a screening for the risk of falls together with the annual health assessment of the elderly by the Timed Up and Go. Still, the screening assessment did not cover all older adults due to limited staff and lack of data analysis since there are no clear indicators and lack of clear guidelines for screening and risk management. Moreover, the service of the health-promoting hospital focuses on treatment to relieve symptoms in the event of a fall.

2) The screening tools for falls in the elderly in a specific way are complicated and come from many agencies, such as the Division of Non-Communicable Diseases, the Department of Medical Services, and the Department of Health. Hence, it confuses the officials. Moreover,

some of the elderly lack the awareness to monitor their falls. Regarding the project related to the elderly, they never surveyed the needs of the elderly before starting the project.

3) The policy: sometimes there are problems in elderly care in terms of policies, such as a lack of clear responsible persons, supervision, and monitoring of the operations of relevant officials. The budget from government agencies has been delayed.

4) Community stakeholders lack the knowledge and understanding of the problem of falls among the elderly. And the knowledge of how to prevent falls among the elderly in the community. Moreover, the community lacks a media and booklet to support the fall prevention campaign. Generally, elderly care focuses on those with chronic disease and dependency only. Moreover, some older people do not participate in the community's activities due to missions or physical conditions, such as elderly who have physical performance deteriorates or no convenience in travel time. In addition, some people cannot join any social activities due to a family or a personal attitude, etc.

1.3. Section 3: Perception of Falls among the Elderly in the Community

From in-depth interviews and group discussions with representatives of the elderly in the community, nurses, public health officers, village health volunteers (VHVs), and those executives of the Sub-District Administrative Organization on the perception, beliefs, and attitudes of falls among the elderly in the community and fall prevention behaviors including perspectives on fall prevention in the community. The information using to support the development of a fall prevention model for the elderly in the community. After analyzing the content, it can be concluded as follows:

1.3.1 Perception of Falls in the Community
1.3.1.1 Perception on Falls through Perspective of the Elderly

Regarding the content analysis results from in-depth interviews and group discussion of 20 elderly in the community with mean age (of 72.09 ± 2.40 years), most of them (84%) were females. The data analysis revealed the following essential data:

1) Falls can happen to anyone due to aging and deteriorating health.

"I used to stagger and fall when I got out of bed in the morning. When I tried to get up quickly due to standing with weak legs, but I think it's okay and normal for the old (female, age 75)."

"My eyes are blurred. Without glasses, I cannot see. Wherever I go, I often stumble because I cannot gauge the distance (female, age 79)."

2) Falls are unpredictable, causing the elderly to be concerned about falls accidentally. For example, two elders said they had no idea how the recent fall happened.

"I was walking in the garden as usual, but I didn't know how I fell. It was unexplainable (male, age 81)."

"I was careful by slow walking with short strides to prevent falls, but just a few days ago, I fell and woke up and found myself lying on the floor. There was nothing I could prevent from falls (female, age 78)."

3) The elderly was aware of the causes of falls, such as negligence and lack of carefulness.

"Sometimes, I think it might be my carelessness. But, on the other hand, my friends have never fallen (female, age 64)."

4) The elderly was aware that falls can lead to severe complications. In addition, those who have had experiences in the past are concerned about fractures caused by falls.

"I have osteoporosis. The doctor said that if you fall, your bones will break very easily (female, age 79)."

"I've met people who fell and couldn't walk anymore. They need to sit in a wheelchair, and I don't want this to happen to me (female, age 69)."

5) Minor falls do not need to be reported to the family, to avoid increasing of burden and concern from the family.

"I fell, but I didn't hurt much, so I kept quiet. If I told my husband, he would be worried, causing high blood pressure (female, 71)."

"If I said I fell, my kids would not let me do anything else. I want them to see that I am still in good health (male, age 73)."

6) The elderly who are aware of fall prevention's benefits will participate in various community activities, such as exercise, activities in the elderly club, etc.

"If I am careful of falls, it will make my family feel at ease without worry (male, agie 78)."

"My daily walking exercise keeps my legs strong (female, 75)."

"I hula hoop at home every day, making my legs strong as well as my waist and back (female, age 74)."

7) The elderly who perceives obstacles in exercise to prevent falls mostly have physical impairments and is ashamed to do activities.

"My joints and legs are stuck. Doing it will hurt more. I am easily tired, and it will only make it worse (female, age 76)."

"I'm old, so I don't like showing off funny exercise moves (male, 75)."

"I have high blood pressure and diabetes and don't dare to do anything. I am afraid of relapse (male, 72)."

8) From the perspective of home environment management, most elderly disagreed with the suggestion of modifying their homes. Most commented that falls in the house had nothing to do with the environment but carelessness and lack of caution.

"I think home improvement is not necessary. I'm used to it, and it requires a lot of money. Also, I don't like disturbing other people (male, age 81)."

"I've been in this house since I was a kid. Organizing the house wouldn't help anything. Usually, our house is full of things. I won't fall because of this mess. But if I do, it's because I am not careful of walking (female, age 68)."

9) As for attitudes of the elderly and their caregivers about exercise, some think it will increase the risk of accidents while doing activities.

"My daughter doesn't want me to come out and walk or practice sit-up like this. If I get dizzy and faint, my other children will blame her. (Female, age 74)."

"I have osteoarthritis of the knee. If I do exercise, I will surely fall. It's going to get worse (female, age 69)."

10) Emotional Responses to Falling. Almost participants in this study had experienced at least one fall, and many had sought medical attention for their falls. When asked how they felt about the fall, the participants had emotional responses that were similar, expressing anger at themselves, fear, and embarrassment.

"You know, it's embarrassing. One day, I was one of the old men, who lay down on the floor, people look at me (male, age 74)."

"I was frustrated that I couldn't take care of myself and then felt blamed for why after falling, I felt so scared (female, age 79)"

1.3.1.2 Perception of Falls from the Perspective of Community Health Workers

From in-depth interviews with nursing staff and directors of 2 Sub-District Health Promoting Hospitals (SD-HPH) in the Sa Kaew sub-district, totaling four persons, data analysis revealed significant findings as follows:

1) The problem's perceived severity is due to the experience of caring for the bedridden elderly and hip fractures from falls.

"There are three bedridden elderly due to falls in the community. They need home visits for caring the urethral catheterization every month. The family members had to leave work to care for them (nurse, age 55)."

2) The staff was willing to advise and assess fall risk, but there were limitations on the time and number of teams to provide service and educational materials.

"Firstly, I tried to advise all elderly at high risk to prevent falls and recurrence of falls, but in some situations, this is not possible due to time, and there is also a lack of media and equipment for campaigning in the community (nurse, aged 49)."

"I want to organize a fall prevention training program, but it lacks clear guidelines and teaching material (nurse, age 49)."

3) The staff was discouraged since the operation did not respond to the agency's indicators policy.

"Fall prevention among the elderly in the community of the primary care unit lacked clear policy from the network. Assessments come from many places that now only assess

knee osteoarthritis and annual eye assessment. There is a guideline for the Time up and Go, but no indicator for the annual performance assessment. The existing data have not been revised because of other more urgent work indicators (director of SD-HPHT, age 57)."

4) Health providers perceived barriers of preventive fall intervention in the community since older people were either unaware of their risk of falling or distanced themselves from the vulnerability and stigma, they associated with falling.

" They lack knowledge therefore, as a barrier to convincing the older person to participate an appropriate intervention (nurse, age 55).

1.3.1.3 The Perception of Falls among Stakeholders in the Community

From an in-depth interview with one person in charge of the elderly care of Sa Kaew Sub-District Administrative Organization and four village headmen, critical data are as follows:

1) A person responsible for elderly care from the local administrative organization has a serious interest in solving the problem of falls among the elderly in the community. However, there is still a lack of knowledge and guidelines for preventing falls in the community.

"Sa Kaew Sub-District Administrative Organization has voluntarily joined the project on the development of the elderly care system in the southern community with the research team from Walailak University and would like to join learning about the development of a fall prevention model in the community for further development of the project in the following year (SAO Permanent Secretary, age 49)."

2) Village headmen are interested in the safety of the elderly, want to take action seriously, and are willing to help public relations in the village.

"I'm not old, but now I have congenital disease and obesity. I ever had a knee injury from a fall and thought the elderly would have more severe consequences (female village headman, age 56)."

"The safety of the elderly in the village is concerning. I would be happy to publicize news or knowledge through a community radio (male village headman, 52).

3) Community leaders are interested in the environment and safety of the community but have limited knowledge of management.

"Attending the previous meeting, I want to improve the environment, but now I don't know where to start. I want a standardized approach to improve a safe environment (SAO Permanent Secretary)."

1.3.1.4 The Perception of Falls among Village Health Volunteers

From the in-depth interviews with the leaders of the VHVs, totaling ten people, most of them were females (98.3%). The mean age was 48.7 years old. Mean work experience was 13 years. Critical data are as follows:

1) VHVs are aware of the severity of falls among the elderly in the community through visits with the hospital staff.

"Last year, two old people fell and are still bedridden. We still have to visit the house to give medicine and pampers because now I have to act as the village CG (female, 50)."

2) They are ready to participate in learning and have a volunteer spirit to help implement projects in the community.

"Preventing accidents for the elderly at home is interesting. I think it's useful for everyone, including my mother (female, age 43)."

3) They are concerned about volunteering in the community affecting the Time given to their family.

"Right now, the tasks assigned by the doctor are plenty. If there are other projects, please help me figure out how to go along with my existing tasks (female, age 46)."

1.3.1.5 Elderly' confidence, and motivation to engage in fall prevention.

From an in-depth interview and a group discussion, the elderly had views on fall prevention as follows:

1) Elder people thought that lowering their risk of having a fall and keeping safe was achievable through predominantly addressing behavioral risk factors. Most of the elderly commented on being careful when walking or moving and keeping the body healthy and are ready to learn self-care skills to prevent falls.

"I think most falls are caused by not being careful. All we can do is to be more careful (female, age 69)."

"I think frequent exercise for knee and leg muscles will make legs stronger, so they won't fall easily (female, age 81)."

"To this day, I have never fallen, but I want the doctor to teach me how to care for myself if I am older than now."

"If you don't want to fall, don't be in a hurry. However, you must be careful with every step you take wherever you go."

2) Some elders do not have the skills to take care of themselves to prevent falls since they believe that falls are an accident and cannot be prevented.

"I have never fallen. But, when I get older and exhausted, I might fall. So, I must be more careful (male, age 65)."

"What I do every day is slow down whatever I do. I know that my joints are stuck. I don't know what to do (female, age 77)."

"I fell a lot. Now, I don't want to go out and must wait for my child to take me out. So, I thought it was safe to stay at home (female, age 75)."

2. Phase 2: The Development of a Fall Prevention Model for the Elderly in the Community
Community Preparation before Development

There are the steps of preparation are as follows:

1) Determined the structure of the community's working group by recruiting people involved in the community with clear roles and responsibilities as showed in Table 20. The president of the Sa Kaew Sub-District Administrative Organization (SAO) is the chairman. The working group can integrate the action plan with "The project of the development system for elderly care," which has been operating continuously.

Table 20. Board Structure of the Fall Prevention Project

Position in the Community	Position in the Project
The executive of Sa Kheaw SAO	Project President
The administrators of 2 Sub-district Health-Promoting Hospitals.	Vice President
Sub-district Head men, 6 villages headmen, 11 the representative's elderly, 2 community nurses, leaders of VHVs.	Committees

1.Nurse from Ban Hao Kho HPH.	Project Academics
2. Miss Uraiwan Pantong	
Associate Professor Dr. Urai Jarae Parpal	Experts in the project
Assistant Professor Kamlai Somrak	
Mrs. Tanasawee Prongtang	Treasurer
The permanent secretary of Sa Kheaw SAO.	Secretary
Leader of VHV no. 9	Public relations

2) Set goals in implementing a project to develop a fall prevention model in the community. The researcher and co-researchers determined the project's outcome in 6 months.

3) Developed the potential of the leadership team for preventing falls in elderly people, the main mechanism for driving work in the community. The participants included 15 village health volunteer leaders, one community nurse, and one representative from the SAO with practical training to promote knowledge about falls and risk assessment skills as well as exercise skills for muscle strength and balance, including home visiting skills.

The Development of a Fall Prevention Model for the Elderly in Sa Kaew sub-district.

In this phase, the researcher has utilized the concept of Kemmis & McTaggart (Kemmis and McTaggart, 1988), consisting of 4 steps (Planning, Action, Observation, Reflection) as follows:

2.1 Section 1: Participatory meeting to plan and develop a fall prevention model

Step 1 Planning: In the community working group meeting, the researcher and co-researchers understand the objectives and the roles of participants to develop a fall prevention model in the community by participating in the process, setting an action plan, and assigning responsible persons.

Step 2 Action: Problems were analyzed in study areas and development guidelines were determined. A workshop included 30 people involved in Sa Kaew Sub-District using A-I-C technique with the following details:

1) Appreciation (A): This is to analyze the problems in fall prevention of the elderly in the community that has been operating. The problems related to falls among the elderly were found in 3 main factors: 1) individual, 2) physical and social environment, and 3)

related service systems such as the policy of fall prevention for the elderly. This includes drafting a desirable fall prevention model for the elderly in the community which can summarize issues, obstacles, and development guidelines, leading to an action plan for the development of a fall prevention model for the elderly, as shown in Table 21

Table 21. Problems Related to Falls in the Elderly and Development Strategies

Issue	Problems	Approach to development
1. individual -Perception -Knowledge -Attitude - personal health	1) Lack of knowledge 2) Lack of awareness 3) Have risky behaviors 4) Deteriorating health is the risk of falling, such as deterioration of the eyes, weakness in the limbs, dizziness, chronic diseases.	1. Training community leaders to manage multi-factorial risk in high-risk groups. 2. Annual Risk screening 3.Promoting knowledge activity in the community 4. Public relations campaign 5. Community leaders promoting exercise in community
2. Environment 2.1 Physical	1) There is hazardous environment at home such as stairs without handrails, toilet located outside the home, Asian squat toilet, toilet without grab bar, and bedroom located upstairs 2) The environment in the community is at risk of falling such as slippery floors, without handrails in the bathroom or on stairs.	1. Campaign for modifying environment at home. 2. Creating guidebook for a safe home and environment modification. 3. Propose a local budget for a safe public environment.
2.2 Social	- Elderly without caregiver in family	Action planning for visiting the elderly's homes among the VHV team
3. Related service systems	1) Lack of responsible person for operating in the community. 2) Lack of fall prevention policy. 3) Lack of knowledge of personnel in the community. 4) There are no measures to prevent falls in the community. 5) Incomplete screening for the risk of falls among the elderly in community. 6) Lack of media and equipment for promoting knowledge to prevent falls in the community.	1. Collaborate to design a working structure in community and define a responsible person. 2. develop a potential of leaders in community. 3. To create medias and equipment for promoting knowledge to prevent falls in the community. 4. Setting the screening guidelines and annual falls risk monitoring. 5. Integrate the fall prevention project with the long-term community elder care project using a National Health Security Fund.

	7) Lack of integration of capital and community capacity for using in a fall prevention development.	

2) Influence (I): This is to together brainstorm and create activities or projects to meet the desired fall prevention model concepts. There was brainstorming in Activity 1 on data from the study of factors related to falls among the elderly in the community and data on risk behaviors of the elderly in the community are prioritized by selecting an activity that the community is ready to participate. Moreover, the meeting agreed on the development of a fall prevention model for the elderly in the community according to the situation of the COVID-19 epidemic that focuses on organizing activities at home and the gathering of small group activities that can be operated continuously and safely. The project has been planned to develop a fall prevention model for the elderly in the community, consisting of 9 activities as follows:

(1) Developing leadership potential in Sa Kaew Sub-district.

(2) Screening for the risk of falls among the elderly in the community.

(3) Promoting knowledge on fall prevention for the elderly and their caregivers.

(4) The campaign on fall prevention in the community continuously.

(5) Home visits to manage the risk of falls in high-risk groups.

(6) Promoting exercise in the community

(7) Campaigning to modify the environment to be safe for the elderly.

(8) The forum for lessons learned in the project.

(9) Symposium for Presenting fall prevention models in pilot community.

3) Control (C): This is to prepare an action plan, determine the details of each activity, and assign the person responsible for the activities as shown in Figure 6.

The Action Plan of Fall Prevention Project among the Elderly in the Community

Target group	community nurses, leaders of VHVs, stakeholders	Elderly people in 11 villages in Sa Kaew Sub-dist	Older adults and their caregivers,	People in Sa Kaew Sub-district	30 Older people in the program	-30 Samples -Older people in the community	The houses of older adults in Sa Kaew	The Working team and the stakeholders
Team	Researcher, SOA	HPH, VHVs	SOA, HPH	Community leaders	Researcher team, VHVs		SOA, HPH, CL	Research team
Activity	1. Developing leadership potential in Sa Kaew.	2. Screening for the risk of falls among the elderly in the community	3. Promoting knowledge on fall prevention	4. The campaign on fall prevention in the community continuously	5. Home visits to practice exercise and risk management	6. Promoting exercise in the community	7. Campaign to improve the environment to be safe for the elderly	8 The forum for lessons learned in the project.
	5 May 2020	9 May-10 June 2020	12-14 May 2020	May-Dec 2020	June-October 2020	June-Dec 2020	June-October 2020	June-Dec 2020
procedure	1-day workshop on Knowledge, home visiting Guidelines practice with researchers in the fir week.	Screening consist falls assessment form of the health ministry	Workshop on fall prevention in the elderly for 2 days	Installing billboards at 11 main points in the community and public relations via radio.	nurse, VHV visits to practice exercise, assess and manage individual risks.	1) Distributing exercise booklet to the elderly in the community 2) Monthly exercise campaign in 11 elderly clubs	Assessing and modifying the hazardous environment in the house and community	1) Monthly Review. 2)Lessons learned after the end of the project
Budget	← Local Health Insurance Fund →				Subdistrict Health Insurance and funds from ThaiHealth.			

Figure 6. The Action Plan Fall Prevention Project among the Elderly in the Community

Step 3 Observe: The action plan that the community could carry out during the COVID-19 epidemic focused on the activities in small groups under epidemic prevention measures, such as wearing a mask throughout the workout and screening for infection before participating in a group activity. This strategy enabled the community to carry out activities continuously and safely. The researcher assessed the participation of working groups and community network partners. It was found that participation in opinions was 71%, and 94% of the members completed the meeting.

Step 4 Reflex: The model development from the committee meeting was summarized with five determining outcomes as follows:

1) The community had potential and mechanisms for fall prevention.

2) The elderly and their caregivers were aware of fall prevention.

3) The elderly had improved fall prevention behaviors.

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4) The elderly at-risk group received risk management and corrective care.

5) The fall rate of the elderly in the community decreased.

Regarding the aim of the project, the working team proposed activities in the model development process as follows:

1) Combining a fall risk screening with an annual health and fall screening immediately after a fall.

2) Promoting awareness of fall prevention through positive strategies.

3) Promoting exercise at home in epidemic situations.

4) Home visiting by trained VHVs to manage individual risks.

5) An environmental safety modification.

6) Community campaigning throughout the project.

7) A monthly performance follow-up meeting.

The fall prevention for the elderly project includes two parts; a fall prevention activity in the community and a 16-week fall prevention program for the elderly at home with details as follows:

A. The fall prevention activities in the community

The actions consisted of 4 sub-activities as follows:

1) Screening for the risk of falls among the elderly in the sub-district.

2) Public relations campaign to raise awareness in the community by placing public relations banners at the essential points of each village and in front of 2 health promoting hospitals, totaling 12 points, using the MP 4 to open an advertising and short knowledge through the village community radio every Saturday and Sunday.

3) Promoting exercise to increase muscle strength and balance in the community consists of campaigning in the elderly club in every village once a week and promoting it in the chronic disease clinic of the Health promoting hospitals once a month. The trained village health volunteer team operated these activities.

4) Promoting environment modification to be a safe community for falls, including:

(1) The VHVs assess houses according to the safe home assessment form.

(2) The 46 high-risk houses were referred to the Local Administration Organization for considering a home visit plan collaborating with a responsible person in the community, such as village headmen, Sub-District administrative staff, and public health providers.

The observing stakeholder participation in the development model throughout the study, the results consisted of:

(1) Participation in decision-making was high.

(2) Participation in taking part in the action was high level.

(3) Participating in the benefits was at a high level.

(4) Participating in the evaluation was at a moderate level. The details as shown in Table 22.

Table 22. The level of participation among stakeholder in community

Activities	Participate in decision-making,	Participate in action	Participate in benefits	Participate in evaluation
1. Fall risks screening among older people in Sa Kaew Sub-district.	High	High	High	Moderate
2. Public relations campaign to raise awareness in the community	moderate	moderate	moderate	Moderate
3. Promoting exercise in the community	High	High	High	Moderate
4. Promoting environment modification to be a safe community for falls	High	High	High	high
Overall	High	High	High	Moderate

B. A 16-Weeks Multifactorial Fall Prevention Program for the Elderly

The program was for 30 elders in Sa Kaew Sub-District from June 2020 to October 2020 for 16 weeks. The researcher used the health belief model concept, which consists of four activities as follows:

1) The workshop promoted the perception of fall prevention for the elderly and their caregivers to raise awareness and improve the potential for self-care in the elderly. The

workshop consists of 1) Providing knowledge and training the elderly and their caregivers about the situation of falls in the elderly, perceived susceptibility, perceived severity, and perceived benefits of taking action on falls prevention; 2) promoting the self-care of preventing falls, self-risk assessment, and self-medication review.; 3) established the fall prevention manual, which suggests making your home environment safer. In addition, on a day of training, we discussed and exchanged experiences of falls.

2) The workshop was organized to demonstrate and train exercises according to the Otago Program for the sample group, community nurses, and the village health volunteers with physical therapists. The duration of the training was two days.

3) Community nurses and village health volunteers visited the elderly's homes to manage the individual risks including reviewing the medicine affecting falls or recommending safe environmental modification.

4) There was a home visit to install a home exercise step banner, exercise training with the researcher, and home exercise monitoring by trained village health volunteers and encouraging phone calls from the researcher.

The observation and recording activities consist as follows:

(1) Assessing fall prevention behaviors before and after the workshop on promoting awareness of fall prevention among the elderly.

(2) Assessing the TUG Test, 30-second chair stand Test and 4-stage balance Test before and after the program.

(3) The participants were observed participating in the program.

(4) Home visits to observe by taking photos, reporting individual risk factors before and after the program, and monitoring the participation of the elderly and their caregivers.

(5) The personal exercise recording was observed to evaluate the continuity of the exercise.

In addition, the researcher assessed the elderly's satisfaction with the program implementation after the program.

A monthly meeting was held to monitor the implementation of researchers and co-researchers working in groups in the community to report problems in the community, solve problems, and improve home visit plans to suit the issues of each elder. There are details as follows:

1) The results of reflection on the lack of funding sources for environmental modification were Local fundraising planning from the Sub-District Administrative Organization and the budget for caring for the elderly.

2) Communication between researchers, experts, and community working groups, including participants during the covid-19 pandemic, was resolved by communication via the application Line and Facebook.

3) Relatives of the two samples did not cooperate in home exercise activity, so the VHVs must be a mentor to follow up to cover 16 weeks.

In each monthly meeting, a summary of data was gathered for further model development in the next cycle.

The participant's interviewees commented that the activities were friendly and relaxing and wanted to continue participating. In addition, the elderly was more confident in exercise since a vinyl banner showed the exercise steps for daily practice. In case of a problem, they could call the VHV and staff from the primary care at any time. After the program, they were satisfied with changes in physical health and could move the body more flexibly.

"I felt comfortable when people came to visit like this. Now, I follow the instructions in the manual to prevent falls and do the exercises as shown in the picture. It's easy. After the exercise, I felt better (female, age71)."

"It was nice to have a nurse to check up on me at home and to motivate me. It seems "close to home, close to the heart." (Male, age 80)."

"When the teacher asked about my condition via video calling, I showed gestures. I feel relieved (female, age 80)."

"Working out at home for the first week was painful, and I wanted to stop doing it, but when I received a call encouraging me, I wanted to continue (female, age 72)."

From the interview with stakeholders in the elderly carein the community, they commented on the benefits received from the program, and there were ongoing activities to expand projects.

"We are planning to do educational activities in villages that have not yet participated since the village headman was interested and requested us (nurse of the Health Promoting Hospital)."

"The Sub-District Administrative Organization Committee plans to support environmental improvement in the next year's budget plan (SAO Permanent Secretary)."

2.2. Section 2: Results from Observations on Participation in the Process of Developing a Fall Prevention Model for the Elderly

From the observation, the participation of the stakeholders in the process of developing a fall prevention model can be summarized as follows:

1) The stakeholders were well prepared and coordinated for participating in the activity.

2) As for participation in planning activities, staff and related parties cooperated in providing information and took part in planning the activities as well as coordination and involvement in the opinions in the decision making on the activities.

3) As for participation in activities, the community leaders involved in the model's development expressed their opinions in each activity, including exchanging their own experiences as information for the development.

4) As for participation in monitoring and evaluation, the stakeholders monitored and evaluated the performance and concluded suggestions for the development model. Although there may be different opinions; however, when they concluded the point, there was acceptance of each other's opinions.

3. Phase 3: Evaluation

3.1 Section 1: The meeting for lessons learned from the pilot community

The project working group organized the meeting forum and group discussion of the lessons learned on the development model for preventing falls in the elderly on 13 November 21, 2020, at the meeting room of Ban Hua Khu Health Promoting Hospital, Sa Kaew Sub-district. The participants consist of stakeholders in the pilot community totaling 50 people. The brainstorming was to reflect on the results of the development model and identify the success factors, problems, and obstacles in the implementation. The researcher and assistants stimulated the brainstorming, concluded the lesson learned, and notify to the participant again. Participants were allowed to express different opinions.

From the group discussion, the content analysis was divided into four main issues: 1) the model development process, 2) success factors, 3) limitations or obstacles in the implementation, and 4) improvement. The details of each issue are as follows:

1. The process of developing the fall prevention model in the Sa Kaew Sub-District

The developing process can be presented, as shown in Figure 7, which has the following details:

1) Finding a fund and potential of the community to establish a structured working network committee with clear roles. The community networks involved in elderly care should coordinate with the working team to develop an elderly care system model and a long-term care project for effective integration.

2) Developing leadership potential in the community to prevent falls in the elderly is essential since the community leaders will be a mechanism to drive the program in the community continuously.

3) Organize a meeting to analyze problems and solutions according to the context of the community to develop a fall prevention plan to meet the real needs of the elderly in the community.

4) A campaign to prevent falls of the elderly in the community to motivate and increase awareness of the elderly and their families in modifying fall prevention behaviors should be done at least twice a year to ensure continuity. The main person responsible was the SAO and

the Sub-District health-promoting hospital (SAO budget). The convenient methods were to publicize the audio media, use media banners, provide knowledge in the Elderly Club, Sub-District health promoting hospitals and temples, and distribute brochures.

5) The falls prevention project consists of promoting the knowledge and skills of preventing falls, assessing the risks of falls and a safe environment, and self-management in the event of an accidental fall at home. There was a budget to organize educational activities and a booklet on fall prevention. The main person responsible was the sub-district health-promoting hospital and the SAO using the budget of the Local Health Security Fund.

6) Screening for fall risk in older adults should be done with the annual elderly health screening activities to identify the high-risk groups for planning and assessing individual risk factors.

7) Safe home and community environments policies should utilize the budget from the Local Health Security Fund.

2. Success factors: Key components in successfully conducting activities are as follows:

1) The community has a high potential since they are working on the project, "the Development of Elderly Care System in the Southern Community." The existing working group on elderly care can participate in driving the issue of preventing falls in the community and can integrate work continuously.

2) There is a cooperation network of partners in all community sectors to support and assist the operation of elderly care in the community.

3) The sub-district administrative organization has a budget and a project plan to implement elderly care in the community consisting of annual elderly health screening and the project of a safe home and community environment in the following year.

4) In part of academic knowledge, was supported by a team of scholars from Walailak University in developing a care system model for the elderly, including fall prevention for the elderly in the community.

3. Problems, Obstacles, Limitations in the Implementation and Solution

1) Some elderly in the fall prevention program feared falls and lacked confidence in exercise due to health problems, such as chronic diseases. As a result, the elderly tried to avoid activities at the beginning of the program.

Correction: The researcher has promoted the individual perception of the elderly according to a health belief model theory to increase one's ability to prevent falls. In addition, they installed a vinyl banner for the exercise steps at home for practicing with caregivers that started with light training. When more confident, they will apply to a moderate level continuously. During the activity, they also learned and exchanged experiences in solving problems with the community nurses and the VHVs team to prevent other risk factors related to falls. Hence, the elderly was more understanding of self-care of fall prevention.

2) A home environment modification that found problems arising from the lack of budget for operating.

Correction: Network partners in the community must work together to find a way to help case by case. During the study, the sub-district prioritized the high-risk houses, including evaluating the family's economic problems with assistance from the village's fund.

4. What needs to develop: The stakeholders' opinions are as follows:

1) Health volunteers need to continuously organize fall prevention activities among the elderly since the program is practical and could be applied in the community. In addition, all three activities, including education on fall prevention among the elderly, exercise to increase strength and improve balance. The home environment modifications were not complicated and easy to understand. The elderly can study the manual themselves. Therefore, it should be pushed to continue in the community. In addition, they would like to have activities focusing on the elderly in high-risk groups who are house-ridden and unable to participate in community activities.

2) Local government organizations proposed to promote a long-term project budget for annual screening of the elderly in high-risk groups, safe home and community environment assessment and improvement, and ongoing public relations campaign activities in the community.

"The SAO will propose an annual budget plan for organizing a fall prevention program and safe environment improvement in the community in the following year" (SAO Permanent Secretary)."

"The integrated plan with the long-term care project in the following year will train the knowledge and skills on fall prevention to volunteers in the long-term care program to reduce the number of bedridden elderly due to falls among the elderly in the community."

3) Community leaders, including village headmen, suggested that every activity in the fall prevention program for the elderly is helpful. Still, safe home environment improvement from falls in urgent cases should publicize the support and assistance from the people, such as volunteer technicians or other funds in the village.

4) For public health personnel in the community, nurses in the sub-district health-promoting hospital commented that fall prevention activities for the elderly should be carried out according to the research program and want to develop a more efficient referral.

"Fall prevention model for the elderly can be conducted by promoting knowledge to increase the skills and exercise training activities to prevent falls which can be added to activities of the elderly that are held in the elderly club every month."

"The development of a referral system for the elderly injured in a fall accident is needed for safer operation."

"Coordination of nurses in the community with experts in the health network system is needed with a plan to develop a remote consulting system and referrals to doctors or a multidisciplinary expert among the elderly at high risk in the community."
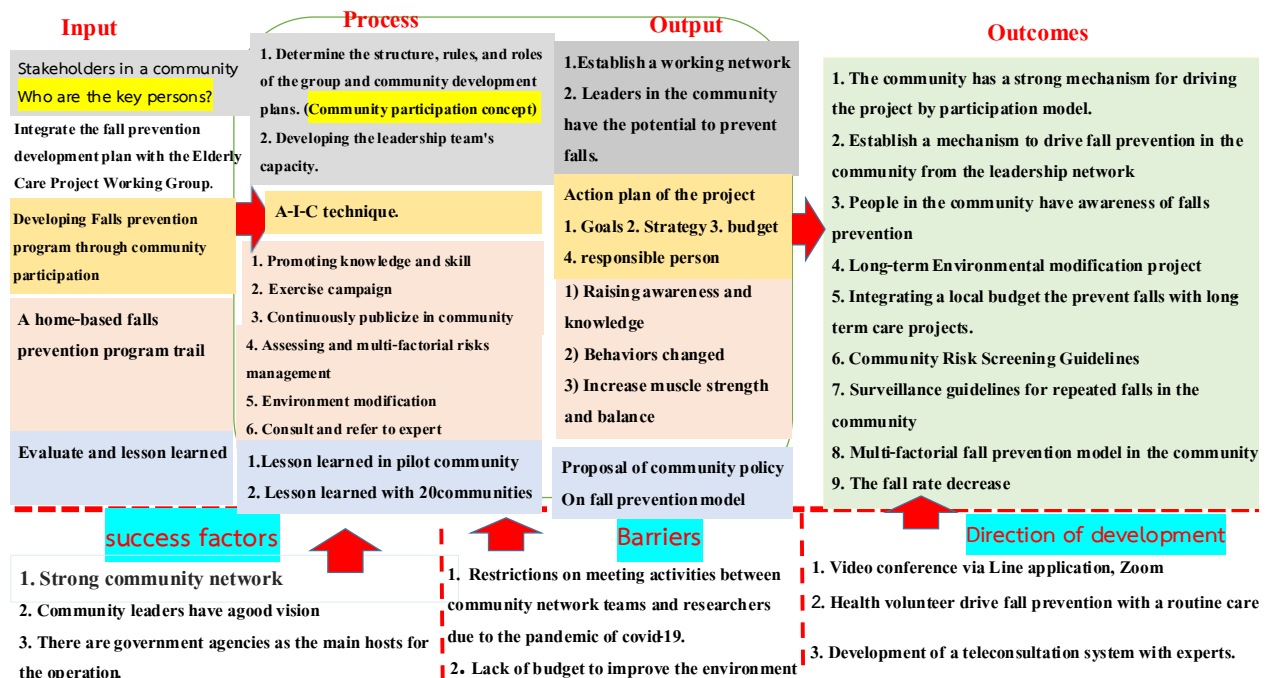
Input

Stakeholders in a community Who are the key persons?

Integrate the fall prevention development plan with the Elderly Care Project Working Group.

Developing Falls prevention program through community participation

A home-based falls prevention program trail

Evaluate and lesson learned

Process

1. Determine the structure, rules, and roles of the group and community development plans. (Community participation concept)
2. Developing the leadership team's capacity.

A-I-C technique.

1. Promoting knowledge and skill
2. Exercise campaign
3. Continuously publicize in community
4. Assessing and multi-factorial risks management
5. Environment modification
6. Consult and refer to expert

1. Lesson learned in pilot community
2. Lesson learned with 20communities

Output

1. Establish a working network
2. Leaders in the community have the potential to prevent falls.

Action plan of the project
1. Goals 2. Strategy 3. budget
4. responsible person

1) Raising awareness and knowledge
2) Behaviors changed
3) Increase muscle strength and balance

Proposal of community policy On fall prevention model

Outcomes

1. The community has a strong mechanism for driving the project by participation model.
2. Establish a mechanism to drive fall prevention in the community from the leadership network
3. People in the community have awareness of falls prevention
4. Long-term Environmental modification project
5. Integrating a local budget the prevent falls with long term care projects.
6. Community Risk Screening Guidelines
7. Surveillance guidelines for repeated falls in the community
8. Multi-factorial fall prevention model in the community
9. The fall rate decrease

success factors

1. Strong community network
2. Community leaders have agood vision
3. There are government agencies as the main hosts for the operation.

Barriers

1. Restrictions on meeting activities between community network teams and researchers due to the pandemic of covid-19.
2. Lack of budget to improve the environment

Direction of development

1. Video conference via Line application, Zoom
2. Health volunteer drive fall prevention with a routine care
3. Development of a teleconsultation system with experts.

Figure 7. The process of the development of fall prevention model in Sa Kaew sub-district

3.2. Section 2: Forum of Lessons Learned from the Development of a Fall Prevention Model for the Elderly in the Southern Community

The Forum of lessons learned on the fall prevention model for the elderly in the southern community was a virtual meeting via video conference due to the COVID-19 epidemic. The representatives from 20 communities in 7 southern provinces and stakeholders totaling 50 joined the audience regarding the results of developing a fall prevention model in the pilot community and brainstormed suggestions to improve the fall prevention model in the community to be more whole.

The presentation of the results of the project in the pilot community included the demonstration of fall prevention skills from the leadership team in the pilot community in the Sa Kaew sub-district, and lessons learned focus on the following issues: 1) What are the key elements of implementation, 2) activities and conditions that lead to success? 3) How does the development occur? 4) What does it look like, including positioning, personnel roles,) structure in operation, 5) resource allocation, 6) knowledge management, etc. The proposed fall prevention model for the elderly in the southern community can be summarized as follows:

1. The fall prevention model for the elderly in the pilot community

There were the following important components and activities, as shown in Figure 8, including:

1) Strong mechanisms have been created in the community to drive the fall prevention model community to operate continuously and sustainably.

The key activities consist of:

(1) The working team from the community networks, appointing responsible persons, assigning roles and duties, and planning the outcome goals.

(2) Develop a leadership capacity on fall preventive skills in older adults.

2) Increased awareness and motivation on fall prevention in the community.

The key activities consist of:

(1) Educating and practicing self-care skills to prevent falls.

(2) Public relations campaigns for creating motivation through media continuously, such as radio, billboards, and brochures.

(3) Exercise campaigns in a community.

3) The falls risk screening guidelines in the community

Regarding to an individual, and the environment in the community.

The key activities include:

(1) Screening for the risk of falls with annual health screening for the elderly.

(2) Assessing an annual safe environment in homes and community.

4) The multifactorial risk management guidelines to prevent falls

The key activities were home visits to a high-risk group to assess individual management, such as medication review, exercise, and home environment modification. Moreover, there is a risk assessment and monitoring plan after the home visit within 90 days.
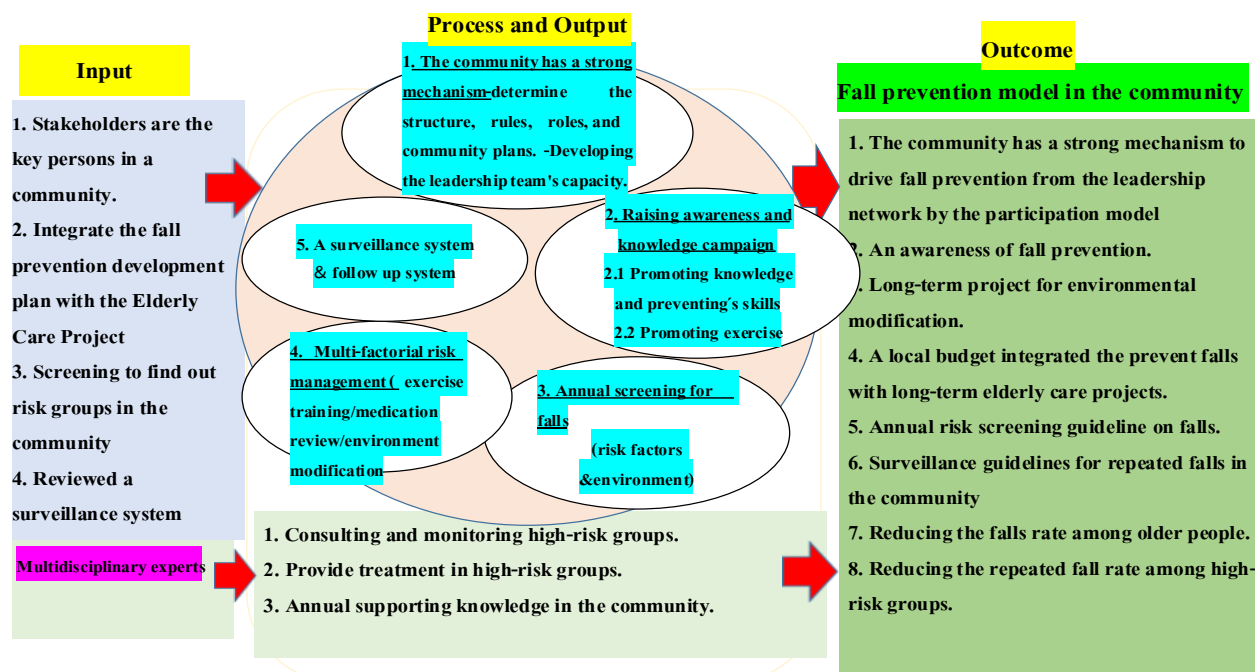
Figure 8. The Fall Prevention Model for Elderly in pilot Community

2. Summary of Development Mechanisms:

From lessons learned and the group discussion found the mechanisms for developing a successful model should consisted of

(1) Determining the structure of the working group.

(2) Developing the leadership potential on fall prevention in the community.

(3) Community participation in analyzing problems and designing an action plan to implement solutions following the community-based context.

(4) Implementation of the plan.

(5) A responsible team follow-up the project and reports in the monthly meetings to resolve problems at regular intervals

(6) evaluate the implementation and organize lessons learned for development periodically throughout the project.

3. Conclusion of the fall prevention model for the elderly in the community

From lessons learned among community leaders from 20 communities, researchers, and scholars, a summary of the fall prevention model that is suitable for the southern community must consist of the following components:

3.1 Strong community with 4 supporting factors as follows:

1) Cooperation among network partners, stakeholders, the elderly, and people in the community.

2) Strong leadership from training on fall prevention in the community.

3) A policy and funding from the local administrative organization and public health services.

4) Knowledge for people's access to adequate information.

3.2 Perception and awareness enhancement in the community

1) Training workshop on fall prevention in older adults.

2) Public relations campaign in the community.

3.3 Community participation with steps as follows:

1) Determining the roles and responsibilities of working to drive in the community.

2) Developing the potential of health providers, health volunteers and caregivers in the community to drive fall prevention activities such as risk screening, home visiting to monitor and risk management.

3) Participate in planning, implementation, follow-up, and evaluation.

3.4 Guidelines for management risk of falls for the elderly in the community

From the group discussion, leaders from 20 communities, researchers, and scholars brainstormed suggestions for the guidelines for the fall risk management for the elderly in the community. Dividing the elderly into three groups as follows: low-risk, moderate-risk, and high-risk groups by designing a fall prevention guideline as shown in Figure 9 with details as follows:

1) low-risk Group

The implementation focuses on health promotions, including:

(1) Public relations campaigning to raise awareness every three months.

(2) Radio in the community to educate behavior modification once a month.

(3) Maintaining a safe environment for older adults.

(4) Campaigning for exercise to increase strength and balance in elderly clubs.

(5) Distribute fall prevention manuals and install billboards on safe environment modifications.

(6) Fall risk screening with the annual health assessment for the elderly to detect and provide care for both risk factors and provoking factors for falls initially or as much control as possible

2) Moderate-risk group

The implementation focuses on health promotions and prevention including:

(1) Visits the older people at high risk of falls to manage individual cases.

(2) Promoting home base exercise

3) High-risk group

The implementation focuses on health prevention and rehabilitation including:

(1) Consulting and referring to the specialist in severe cases such as falling more than two times a year, low blood pressure, poor balance, and eye problems.

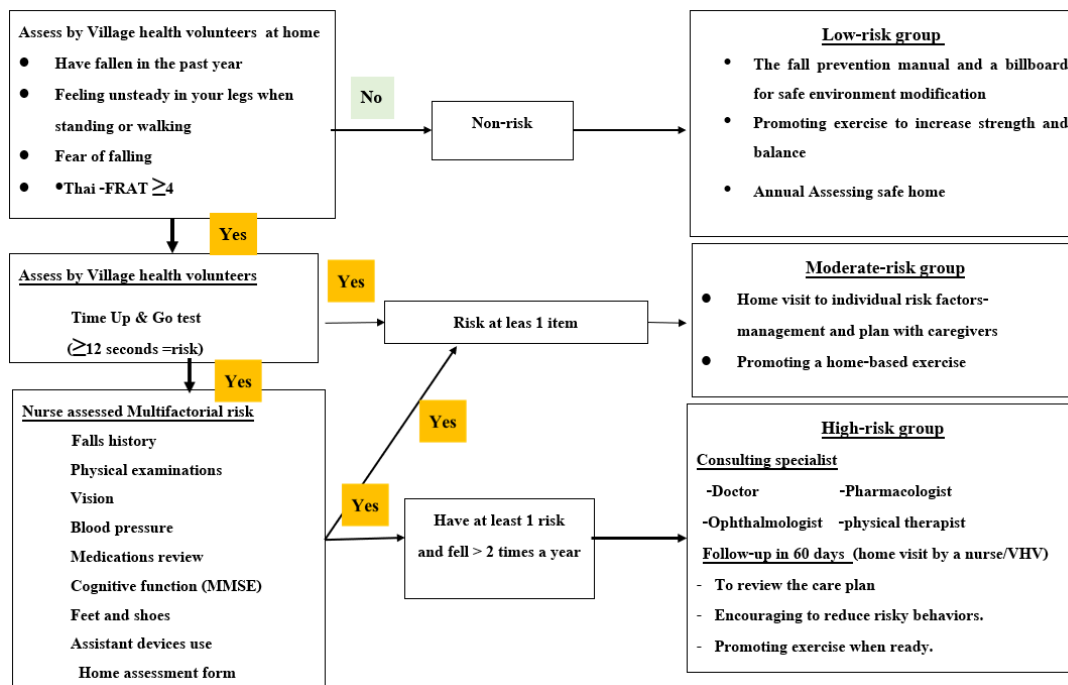(2) Follow-up visits for older adults with a history of falls more than twice a year every six months.

Figure 9.Guidelines for management risk of falls for the elderly in the community

4. Success factors: Lessons learned among community leaders from 20 communities and experts regarding the pilot community's success factors consist of the following:

1) Promoting knowledge and skills on fall prevention in the elderly based on the health belief model for people in the community. As a result, people in the community are aware of the problem of falls and would like to participate in the program.

2) The participation of the community networks in the community found that the pilot community (SAKEAW TEAM) was a collaboration of people involved in the community with the same goal. In developing guidelines for preventing falls in the elderly, all team members are essential to achieving the goal, including brainstorming, planning, decision-making, and evaluation. The process starts with (1) appointing a working team in the community and defining clear roles and responsibilities, (2) assessing and analyzing fall situations and fall prevention measures for the elderly in the community, and (3) participating in the planning, meetings, and implementation, as well as recording and evaluating the results continuously, (4) working following the roles and responsibilities of each committee as well as coordination and communication with the community. These actions will allow the program to succeed.

3) The process had support, including (1) promoting knowledge for the elders which organizing new ways to improve interest in participating in activities without focusing on the classroom, (2) fall prevention manuals for the elderly to implement correctly and continuously, and (3) VHV leaders having the potential to drive the fall prevention's activities and cooperation in the activities of the elderly and their caregivers.

4) Periodic follow-up meetings of researchers and working groups in the community make it possible to resolve problems and deliver flexibility in the implementation for specific periods, especially during the COVID-19 epidemic.

5. Problems:

The group discussion found that the majority of communities had difficulties in their implementations as follows:

1) There was minor support for fall prevention for the elderly from internal and external agencies.

2) Most community leaders still lack knowledge and understanding of fall prevention in the elderly. So, there is no policy and fall preventive measurement in the community. As a result, the responsible personnel in the community cannot provide assistance or full advice.

3) Responsible people in some communities lack an understanding of the relevant budget disbursement regulations for improving the environment in the home and community.

4) The attitudes of some groups of the elderly were not compatible with the activities organized. Therefore, they ignore participating in the activities. Therefore, there should be a survey of opinions and needs before the program.

6. The Policy Recommendations for Development

The lessons learned and group discussions from representatives from 20 communities from 7 provinces provided additional suggestions in the next phase as follows (Figure 10):

1) There should be a long-term fall prevention project and budget approval from the Sub-District Health Fund to be continued every year.

2) There should be a plan to develop a teleconsultation system for a high-risk group between health providers in primary care and the experts.

3) There should integrate a fall prevention program with the project of long-term care for the elderly to sustainably implement the program.
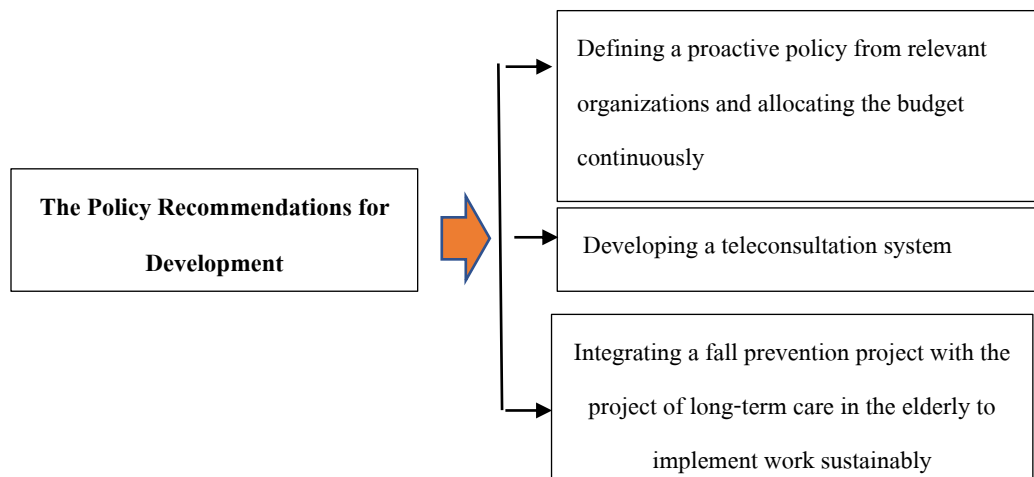

Figure 10.The Policy Recommendations for Development

Chapter 6. Discussion

Chapter 6. Discussion and Interpretation of Findings

The results study on the development of the fall prevention model for the elderly in the community which employed participatory action research, the detail of finding are as follow:

The Prevalence of Falls and Factors Related to Falls among the Elderly in the Southern Community

The retrospective study from secondary data from 20 subdistricts in 7 southern provinces found the prevalence of at least one fall of 12.1%, consistent with a study by Knodel et al. (2015) that found an 11.7% prevalence of falls among the Thai elderly. This differs from other studies in Thailand (Aekplakorn, 2016; Worapanwisit et al., 2018). They found 16.9% and 26.1%, respectively. A study on the elderly in the community in Asian countries found the prevalence of falls from 14.8% to 36.8% (Ku et al., 2013; Mane et al., 2014; Ibrahim et al.,2017; Wu& Ouyang, 2017; Sushilowati et al., 2020). In developed countries, the prevalence of falls among the elderly remained high, such as the United States (Moreland, Kakara, & Henry, 2020) at 28.0% and Spain (Rodríguez-Molinero et al., 2015) at 28.4%. Different prevalence across studies was caused by differences in population characteristics, environment, and lifestyles, including different screening methods and research methods (Gillespie et al., 2012; Han, Ferris, & Blaum, 2014). Other factors might also contribute to the lower fall rates reported in some of these previous studies. According to the survey on the history of falls in the previous six months, there may be a bias in the memory recall of the elderly, especially falls that did not result in injury or happened months ago. In addition, not a clear definition of a fall and different interpretation of what a fall is between older people and interviewers. Moreover, from a cultural perspective among some Asian populations, falls may be a disgraceful experience that they fear might be reported to others (Shin et al., 2009). The results found the independent risk factors that predict falls as follows:

1) For taking more than three medications, this is consistent with a study (Woolcott et al., 2009) that found using sedatives, psychotropic medication, and antidepressants was

significantly correlated with falls. Furthermore, taking more than three other medications was also a significant risk factor. However, a study (Ziere et al., 2006) showed that multiple medications were not a risk factor for falls except when medicines that one of the risks.

2) For balance problems, Jeon et al. (2017) conducted a cohort study of the elderly who did not fall, fell once, and experienced repeated falls. It was found that the elderly who did not fall had higher scores on dynamic and static balance than the group with falls.

3) For the elderly with reduced mobility in the semi-dependent group (ADL 5-11) increases the fall risk. A previous study (Sekran et al.,2013) found that people with mobility problems would experience once within two years with 1.78 times the injury, 2.36 times at least one fall without injury, and 3.75 times ≥ 2 falls with at least one injury. It is consistent with the study in Korea showed that the independent risk factor for falls was ADL (Shin et al., 2009). Therefore, the elderly with limited mobility were probably more likely to fall when trying to do activities that exceeded one's abilities.

4) For cognitive disability, a former study (Allali et al., 2017) found that individuals with intellectual disabilities had an increased fall rate compared to normal older adults with increased gait impairment.

5) Females were likely to experience falls more than males. This result is consistent with other studies (Knodel et al., 2015; Gale et al., 2016) due to a decrease in bone mineral density after menopause (Daly et al., 2013). Males were more physically active and had greater muscle strength, and frailty increased with age and affected females more than males (Collard et al., 2012).

6) For vision impairment, Harwood's study (2001) found that people with vision impairment decreased in-depth perception. Therefore, they were 1.7 times more likely to experience falls than normal people and 1.9 times more likely to experience falls multiple times than those with normal vision.

7) For hearing problems, the findings are consistent with the study (Viljanen et al., 2009) found that older women with hearing problems had a risk of falls 8.8 times higher than

those with normal hearing. In addition, Lin & Ferrucci (2012) found that every 10 decibels of hearing loss increased the chance of falls over the 12 months to 1.4 times that of normal people.

8) For those with walking aids, a previous study (West et al., 2015) reported that people with walking aids were 12 times more likely to fall over three months than normal people since they were frail and had difficulties in balance and/or movement. In addition, Chen et al. (2011) found that those people were at an increased risk of falls and injury without assistive devices, and Cruz et al. (2020) also found that frail elderly fell on a day without a walking aid.

9) For the elderly with toilets outside the house, a previous study in Thailand (Sophonratanapokin et al., 2012) found that this kind of fall was related to insufficient lights in the corridor, uneven or slippery, or obstacles on the floors.

10) People with jobs as a protective factor against falls were found to reduce their risk of falls by approximately 20%. A study by Kim et al. (2020) found that unemployed elderly increased the risk of falls by 1.2 times, while Kumar et al. (2014) reported that employed elderly can reduce the fear of falls by 45%. It can be explained that employing the elderly's body movement or encouraging them to participate in social activities will help them to increase confidence, improve memory and concentration which is an actual reason for reducing their falls.

Although the hazardous environment inside the house was not the predictive factor of falls; however, it correlated with the prevalence of falls in this population. Consistent with the study of Stevens et al. (2001), walking on slippery floors and living in low-light conditions may increase the risk of falls. Aekplakorn (2016) found that 37.2% of the Thai elderly fell on slippery and uneven floors 15.9%. Maneeprom et al. (2018) found that healthy elderly with two or more high-risk home environments increased the risk of falls by 6.3 times.

A study of the prevalence and fall risk factors among the Thai elderly in the community has provided the knowledge to be prioritized in planning an appropriate fall prevention program. Organizing activities to focus on correcting factors that have predicted values from high to low, such as medication review, exercise campaigns to increase strength and balance, rehabilitation of people with mobility impairments, safe environmental management, and annual fall-risk

screening. The development of a fall prevention model for the elderly and the study of the multifactorial fall prevention program combining with an exercise program for the elderly in the high-risk group are interesting for further study.

The Measures of Fall Prevention and the Problem of Implementations

The fall prevention measure in Thai Communities was unclear; however, there are guidelines for elderly care regarding fall prevention such as the annual health screening and assessment for older people, the long-term care project, and establishing and supporting activities in the elderly clubs. Most difficulties in implementing fall Prevention consist of minor support from the agencies, the leaders' lack of knowledge and understanding of fall prevention, no policy and fall preventive measurement, and the negative attitude of the elderly toward falls.

The finding is consistent with a study on the fall prevention policy and implementation in Thailand (Kespichayawatt,& Khongboon, 2021) found the barriers to implementing fall prevention programs include patients/ relative's unawareness of the importance of preventing falls, the constraint of personnel. Inconsistent with practice, different assessment forms, which is not clear which one to use. There was a common misunderstanding during policy updates or policy transfers to personnel who take over the operations. Findings suggest the need for government and local agencies to consider tailoring some public health approaches to prevent the accidental falls. This study also highlights the necessity of proper work environment maintenance to prevent these falls.

The context of the pilot community

The Sa Kaew Subdistrict is one of 20 communities participating in the program on "the development of the elderly care system in southern Thailand." This community is ready to be a pilot community to develop a fall prevention model with the working team from all sectors of society. Still, the community lacks knowledge and experience in action on fall prevention for the elderly in the community. The elderly in the community had a history of falls in the past six months of 20.8%, and the proportions between males and females were not different. In addition,

62.9 percent of the elderly were injured after a fall, while 12.9 percent of those who fell were hospitalized.

In this study, although the participants had a mean age of 77.7 years, most (85.2%) were able to perform daily activities on their own (ADL≥12), but most had underlying medical conditions (76.6%), especially hypertension (54.0%). These reasons may increase the chance of falls (Li et al., 2006), especially from the side effects of the medicine (Seppala et al., 2018). Most falls occur inside the home, most often during the day. The result is consistent with previous studies that found falls often occurred during the day, and most fell inside and around the house (Poncumhak et al., 2014; Piau et al., 2020) since, in the daytime, the elderly was engaged in daily activities. On the contrary, overseas studies found that healthy elderly fell more often outdoors than indoors (Bergland, Jarnlo, & Laake, 2003; Bath & Morgan, 1999). Consistent Li et al. (2006) found that the elderly's falls were related to physical activity from tripping or slipping on an object, which often happens on sidewalks.

Based on the researchers' observation, most houses have some hazardous home environments such as uneven ground floors and untidy (messy), stairs without handrails, and floors being of different levels. The finding is consistent with a recent study (Jiraporn and Pattaraporn., 2021) from the Thai housing survey found that the accommodation of the elderly 59.6 percent of stairs have handrails, only 3% of handrails in a bedroom, there are bathroom handrails only 9.7 percent and having an outdoor lavatory. The survey found characteristic of the toilet was similar to those found in the rural community of Thailand, such as no handrails in the bathrooms and the squatting toilet. The survey results are consistent with previous studies in Thailand found that environmental factors were a significant cause of falls since it is related to the daily activities of the elderly and realized that the hazardous environment could be modified and prevented (Sophonratanapokin, Sawangdee, & Soonthorndhada, 2012; Aekplakorn, 2016; Sorysang, & Natetanasombut. 2016; Rongmuang et al., 2016).

The fall preventive behaviors of the elderly in the community

It was found that the elderly had a high level of behavior. The three most common fall prevention behaviors are that they do not drink alcohol when feeling dizzy, they stop doing activities immediately, and when they feel unbalanced, they stop moving and find a stable anchorage. Since the elderly in this study, most of them are Buddhism. As a result, few people drink alcohol. Moreover, they lived in the community prioritizing elderly care, allowing people to have access to the health information in the area thoroughly. The lowest mean was exercise at least three times a week. The sample group may perceive and understand daily chores, farming, and gardening as exercise since 98.2% of them were farmers. This result is in line with Kamolporn Chantakumbong, Somchit Suphanthat, and Paitoon Suksrinam (2015). Whose studied the development of a model for promoting exercise among the elderly and found most of the elderly lack exercise, perceiving that walking to farming and gardening can replace exercise. Therefore, the community should plan to promote awareness and create motivation for exercise among the elderly continuously. The study by Manasatchakun et al. (2016) found that social factors, motivation, and environment affected the physical inactivity behavior of the elderly with a statistical significance of 0.05. Other studies have found that fall prevention behaviors were based on individual perceptions and experiences. For example, Nattkanthiya (2010) said that fall prevention knowledge is related to fall prevention behaviors, perceived risk of falls, and perceived barriers to preventing falls. In addition, the motivation for fall prevention actions is also correlated with fall prevention behaviors. This result is consistent with Pornthip Julabutr (2010), who reported that educating the elderly would lead to better fall prevention behaviors. Unlamai (2010) said that a good level of self-efficacy was associated with good fall prevention behaviors.

In addition, minority participants went to the doctor for an annual eye examination. It could be explained that most participants without vision impairment (70.9%) had limited physical movement, making them dependent on their families, and limitations on travel expenses, making them unable to see a doctor. Participants may perceive and understand that eye problems were typical in the elderly, caused by age deterioration which cannot be cured, so it was not essential to see a doctor. A study by Laom Soisang et al. (2014) found that most older adults had vision

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impairment which was the most common cause of tripping. If they are aware of visiting a doctor for proper examination, this will reduce the risk factors of falls. For fall prevention behaviors of the elderly concerning external factors, most participants had normal fall prevention behaviors, including wearing fit shoes (80.2%), keeping the bathroom floors dry (74.0%), and having stability checks on furniture such as tables, and chairs, or beds (69.2 percent), respectively. Since the participants lived in rural areas of Thailand, the shoes commonly used wear are sponge sandals with low heels that can be bought locally, and they can easily choose the shoe size to fit their feet. In addition, most of them lived with their family members to take care of the bathroom in the house and check the stability of the furniture.

Furthermore, the participants lived in a rural community in the south of Thailand which looks like a community with relatives who live nearby and can help and supervision in carrying out extensive lifting activities, including house repairs. Supattra Sriwanitchakorn (2013) stated about the integrated care of the elderly in the community that social support for elderly care to prepare the home environment appropriately would help the elderly to rely on others as little as possible through cooperation with families and communities. Furthermore, Yardley et al. (2006) found that the elderly who were more aware of the effects and dangers of falls and the benefits of fall prevention behavior would adjust their behaviors for fall prevention.

Therefore, the self-promotion of fall prevention behaviors encouraged by the elderly, their families, caregivers, and people in the community to be aware of falling is critical. Promoting awareness of risk factors and perception of the dangers or effects of falls are necessary to take care of themselves, including appropriate fall prevention behaviors according to potential, especially self-reliance in the family and community before will be supported by the government agencies.

The perception of falls in Elderly in the community

The study of the perception of falls aimed to understand older people's perceptions of their falls risk, to increase understanding of why older people did not participate in falls

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prevention programs, and older people's reluctance to engage in falls prevention. In addition, also to understand the perception of the stakeholders in the community on implementing fall prevention. The finding could stimulate idea regarding alternative engagement strategies in the next fall prevention program in the community. From the in-depth interviews, it was found that

1) Some of the elderly thought that falls were a regular occurrence in old age, which cannot be avoided or predicted. Therefore, some elderly accepts their own deterioration and did not want to participate in falls prevention activities in the community. Consistent with the study of Kiyoshi-Teo et al. (2020) that when the participant perceives that the risk of a fall is permanent or hard to improve or prevent are more likely to accept the risk of falls or refrain from following the fall prevention guidelines. Some will blame themselves for falls caused by their carelessness and guilty, but no participants understood the multifactorial nature of older adult fall risk (Deandrea et al., 2010). When they experience minor falls, they will not tell anyone because they did not want to make the family worry. This result is consistent with Horton and Dickinson (2011) revealed that older adults avoided talking about falls and hid their falls from their adult children to avoid worrying them and being concerned that they might become a burden to their children. The elderly was not ready for exercise for fall prevention. Most of them perceived barriers to physical disabilities and were embarrassed to do social activities. Stevens and colleagues (2017) said that the acceptability of exercise for fall prevention is influenced by cultural values and beliefs. Consistency with the study in Asia (Horne, Skelton, & Todd,.2014) found that many Asians felt older age was a time to rest or relax. This study found many older adults felt that exercise for fall prevention was needed after physical weakness became noticeable. Therefore, promoting awareness and a positive attitude are essential for the strategies to improve fall-preventive behaviors among the elderly.

2) Health personnel was aware of falls in the community but still lacked clear guidelines and skills in implementing the program in the community. Healthcare practitioners have a crucial role to play in identifying fall risk factors in older adults and assisting older adults to understand the importance of reducing their own risk, not only in terms of their medical

conditions but also concerning their environment and how they engage and participate in activities. Early identification of fall risk factors, combined with appropriate referrals to other health providers when needed, could reduce older adults' fall rate. Therefore, the potential of health personnel in the community should be developed and can integrate the work on fall prevention for the elderly with regular health- care for the elderly.

3) Stakeholders and community leaders were ready to operate but lacked knowledge and experience. Therefore, developing potential and learning together in the model development on fall prevention in the community would help the stakeholders continuously and sustainably drive the fall prevention program for the elderly in the community. The design of fall prevention in the community required the promotion of awareness to increase one's ability to prevent falls first. Rosenstock et al. (1988) suggested that preventive behaviors occur in individuals when they perceive the risk and severity of disease, as well as recognize the threat and possibility of behaviors. Therefore, promoting perceive benefits to weigh against perceived barriers is necessary for implementation. This includes gaining media knowledge, campaigns and advice from experts and promoting self-efficacy (Bandura, 1977).

The Development of Fall Prevention Model

This study revealed the use of a multi-factorial approach was an effective means of reducing elders' falls in the pilot community. The researcher employed the Health Belief Model as a guideline for developing a fall prevention model in the Sa Kaew subdistrict as participatory action research with four steps: planning, action, observation, and reflection. For the Planning step, the AIC process was applied, namely: Appreciation (A) to jointly analyze the problems in the elderly health care area that has been operated and establish a desirable fall prevention guideline or model for the elderly. Influence (I) to jointly brainstorm ideas and create an event/program design to respond to the concept of a desirable fall prevention model for the elderly with the brainstorming in step 1 based on the data from the study on falls in the elderly

in the southern community and in the pilot community that developed data on perceptions and fall prevention behaviors among the elderly in the community. Control (C) to formulate an action plan and details for each activity and determine clear roles and responsibilities for the activities. These results are consistent with Chongrak Jaichan et al. (2019), who found the development of service access for psychological patients through Appreciation Influence Control (AIC). This process is consistent with the study by Prathum Kongmaha and Kannikar Hansungnern (2017), who found that the development of the elderly care model using A-I-C consisted of: Assessing the elderly's health. Coordinating community planning for elderly care. Potential leadership development. Plan implementation. Follow-up and evaluation.

The effectiveness of fall prevention program based on the health belief model

The older people who participated in a Fall Prevention Program included a 2-day fall prevention education sessions, a 1-day exercise training sessions, and then practiced home-exercises 30-45 minutes x 3 days per week though 15-week of intervention.

In the session of education was very importance time to develop the participants about the health belief pattern for fall prevention behaviors. A education of fall prevention behaviors session and an exercise session which were guided by the constructed of the Health Belief Model, Adult learning principles, and considerations about normal aging changes related learning ability in the elders, could significantly improve the health belief pattern about fall prevention behaviors in the participants. After 16 weeks of the program, the participants had a mean score on fall prevention behavior higher than before participating in the program with a significance of 0.05. This is consistent with the study by Manita Raksrinareerat et al. (2019). They found that the experimental group had better fall prevention behaviors than the control group.

Health Belief about fall prevention behaviors in older adults was the personal belief that when a person perceives susceptibility and severity of the consequence of a fall. Therefore, there was a perceived protective action that was very effective. Regarding the home visiting of community nurses and VHVs as a supporting and increase confidence, they felt the fewer barriers

to practice the falls preventive behaviors, they were cued to actions and had self-efficacy in fall prevention behavioral practices and participate in the home-based exercise. Finally, they improved the fall prevention behaviors which included carefully taking medicines, home modification, slowly changing position practices, and continuously practicing strength and balance exercise 30-45 minutes at least 3 days per week through 15 weeks of the program.

Jitramontree et al. (2015) employed a community-based multifactorial fall prevention program, including a fall risk assessment, home visits, a safe home environment assessment, and the distribution of fall prevention manuals. After the program, the elderly in the experimental group had better fall prevention behaviors and fall prevention motivation. Therefore, it can be concluded that a multifactorial prevention program with a risk assessment and risk management to reduce individual risk factors with exercise and a safe environment can reduce the risk of falls.

This present study demonstrates that the participants improved postural balance after 16 weeks. The exercise program developed from the Otago exercise program (OEP) (Campbell & Robertson, 2003). The exercise program encompasses essential aspects of fall preventive exercises including postural balance retraining and muscle strengthening. It is a step-by-step exercise from easy to difficult, focusing on stretching to improve the balance and stability of the muscles and joints of both legs. After the program, the participants reduced the meantime of balance walking with a statistical significance of <.001. For leg muscle strength changes, the mean number of times in a 30-second chair stand increased with a statistical significance of <.001. For balance changes, the participants improved balancing to stand with a statistical significance of .05. Although a systematic review by Susie Thomas (2010) showed only 36.7% of participants complied with the OEP program continuously three or more times a week; however, this study integrating the HBM concept and strategy of home visits of nurses helps to promote all the participants to adherence practice until 16 weeks.

The result of practicing exercise is consistent with the study by Thanyarat Anothaisinthawee et al. (2014), who found exercises to practice gait and balance, and movement for training strength muscles were highly effective. This is consistent with the Taiwan population

study by Hsuei-Chen Lee et al. (2013). They found that after 12 weeks, 616 older people with a history of falls after participating in a multifactorial prevention program, including education, adjusting the environment, examining the eyes, adjusting the medication, and eight weeks of exercise training, could decrease the risk of falls and improved gait and balance. Home visits to assess and manage the individual risk factors by community nurses and leaders of VHVs are necessary for preventing falls among the Thai elderly in the community. Since older people and caregivers could participate in the risk assessment and planning of risk management, moreover, continuous follow-up from the VHVs who already take care of their families can effectively improve the fall-preventive behaviors of the elderly. This is consistent with a study by Somton, Rawiworrakul, and Amnatsatsue (2013), which found that with the implementation of a multifactorial fall prevention program with home visits, the elderly in the experimental group had scores on self-care behaviors to prevent falls higher than the control group with a statistical significance.

As for satisfaction of this project, both the elders and community stakeholders were highly satisfied with the project. Since noticeable changes among the elders, regarding fall preventive behaviors, and physical performance. In addition, participants' pride is their involvement in the development and operation of community programs that influence everyone's satisfaction.

The home-based falls prevention program focuses on creating positive lifestyle changes to promote independence through both group-based discussion and exercise, the home-based practice of exercises, and other protective behaviors. This approach is in accordance with previous research demonstrating that older people prefer fall prevention programs that include social support and interaction, low-intensity exercise, and promoting knowledge. (Bunn et al., 2008; Ye et al.,2022)

Lessons Learned from the Process and Program Summary

Based on lessons learned from the implementation of the fall prevention program in the pilot community, stakeholders in the pilot community concluded a community-based fall prevention model with the following components:

1) A strong and potential community required main activities, namely (1) appointing a working group in the community from stakeholder co-operation with clear roles and responsibilities, and (2) developing leadership potential to obtain skills in fall prevention in the elderly as a mechanism to drive the program in the community. A previous study (Kittipimpanon et al., 2012) found that the supporting factor of the fall prevention program in the community was the stakeholders since they have a role cooperating in the community. A foreign study found that working in the community required community leaders to join in driving the work to diminish barriers to implementation (Hanson, & Salmoni, 2011). A study by Hacker et al. (2012) found that empowering community workers would allow them to drive the program sustainably.

2) Raising awareness in the community for adjusting the fall preventive behaviors that required main activities, namely (1) educating on self-care for prevent fall, (2) continuously public relations campaigns to create motivation. These results are consistent with a study by Boongird et al. (2017) found that awareness and attitudes after accepting advice from village health volunteers and media significantly increased the issue of enthusiasm for health care, exercise, and fall prevention. It can be concluded that the productive process of health-promotion media that focuses on health care for slowing down aging and inserting content on fall prevention, media dissemination, and advice by the public health volunteers was a strategy for raising awareness and a positive attitude toward self-care on fall prevention. This is consistent with a study by Healy et al. (2008) reported that the effective strategy for changing positive attitudes and increasing the health awareness of the elderly was the preparation of media for dissemination and organizing training for volunteers to advise and organize activities for the elderly. The content should focus on good health and slowing down aging as well as the outcome of being able to help themselves independently. The findings found that the elderly and caregivers have changed their attitudes and significantly improved awareness.

3) Sorting out the elderly with high-risk groups in the community required main activities, namely (1) screening for the risk of falls with the annual health assessment of the elderly and (2) history taking of falls every time they received services in the hospital.

4) Individual risk management in the elderly required the main activities, consisting of (1) home visits to assess and manage individual risk factors, such as medication review, keeping a safe house, using assistive devices, wearing glasses, and promoting exercise.

5) Surveillance of repeated falls required main activities, namely visiting homes for elderly who have fallen more than twice a year and assessing and monitoring the risks after home visits within 90 days.

6) Ongoing community campaigns to raise awareness required main activities, namely (1) public relations to create motivation through media, such as radio, public billboards, and brochures, and (2) community exercise campaigns.

Lessons Learned from the Study

1) Cooperation from the potential leaders in the community, such as VHV leaders, staff in the subdistrict health-promoting hospitals, community network partners, and local government organizations, is a mechanism to drive implementation in the community.

2) The development process of a community participatory fall prevention model makes the stakeholders in the community understand the issue and be aware of the impact of falls among the elderly, covering internal and external risk factors. Determination of falls prevention patterns in the community necessarily includes important interventions, such as (1) promoting knowledge and skills in preventing the risk of falls, (2) training exercises to improve muscle strength and balance, (3) public relations campaigning in the community to raise awareness and motivation to modify fall prevention behaviors, (4) screening the risk groups in the community, and (5) home visiting at high-risk groups to assess and manage individual risk factors, and (6) assessing and improving the safe environment at home and in community.

3) Nurses' role in the community is the coordinator who collaborates with other professionals in the community. The participation among nurses found that they are responsible

for providing education to community older adults, promoting, and enhancing their fall risk awareness, and home visiting. In addition, the important role is training and mentoring the village health volunteers to work efficiently and safely.

The limitations of the study

Though the studies in this thesis have achieved the aims; However, the relevant main limitations are also stated below:

1) the prevalence of falls in this study was analyzed from the secondary data in 7 provinces. Thus, a prospective study should be warranted to draw findings on the incidence and predictors for falls among Thai older adults in the community around the country and verify the results of this study.

2) The secondary data from the annual health screening form according to the Ministry of Public Health guidelines. It was created to collect a multidimensional survey, not just only fall screening.

3) The study effect of a fall prevention program was effective only during the completion of the project. Therefore, the long-term impact of the program cannot be outlined. It may or may not be affecting the elderly in the community.

4) Adjusting the safe environment in the houses also has limitations on the finances and responsible organizations. This appeared to be due to families' available financial resources, and the budget needed from the responsible organizations to make safe environment modifications within the community. Therefore, long-term planning is required for correcting.

5) The study did not assess the outcome of the number of falls after the program.

6) The situation of COVID-19 caused limitations on the number of people and places for activities of the working group team. Therefore, forum preparation in the community also changed according to the situation by adding a communication channel to contact the

participants via video calls and a Line group chat, meetings online between the research team and assistants in the community and reducing the number of people in the activities.

Suggestions for Applying the Research Findings

1）For the implementation, fall prevention in the community can be applied in routine tasks, such as inserting exercises according to the program in health promotion activities or home visits for the elderly with chronic diseases. A multifactorial fall risk factor assessment should be undertaken, such as a balanced assessment, medication review, and environmental risk assessment. The risk of falls screening should be combined with the annual health screening for the elderly. In this regard, the potential of nurses in the community for risk assessment should be developed. Creating a fall prevention guideline for the nurses to provide knowledge on fall prevention, assess and manage risk factors comprehensively, and mentor village health volunteers and leaders of all sectors in ongoing fall prevention work in the community.

2) The activities to promote awareness of preventive falls based on the health belief concept, such as academic activities, individual fall risk assessing to inform the elderly about the level of risk and recommending appropriate fall prevention according to the assessed risk factors. Therefore, the elderly believes and are ready to change their behavior to prevent the risk of their falls. This activity should be held in the elderly club every month and in the community at least once a year.

3) The most critical fall prevention guideline in the community is primary prevention by searching for risk groups for prevention before falls or injuries. The action at the community level should focus on monitoring risk groups, giving advice on exercise and nutritional care, vitamin D and calcium supplementation, assessing the risk of falls from medication, screening for postural hypotension, and taking care of a safe home environment for the elderly.

4) For policy, there should be a policy for agencies in the community to recognize the importance of falls among the elderly and plan environmentally friendly management for the elderly in all areas. Including the installation of warning signs in areas with different levels,

making handrails around stairs, steep slopes in public restrooms, etc. In addition, the local government organization should have a policy to support the budget to manage a friendly environment for the elderly at home and in public. The community should develop a fall surveillance system and an emergency referral system to prevent repeated injury in case of a back or pelvis injury, Etc.

5) The public health organizations should promote widespread adoption the Fall prevention model to all local levels.

Suggestions for Further Research

There should be a study to evaluate the effectiveness of the fall prevention model development in the pilot community and other communities in the long term for at least 1-3 years to support the development of a sustainable "model village" and a fall prevention model for the elderly to other communities in Thailand.

Chapter 7. Conclusions

Chapter 7. Conclusions

The study on the development of the fall prevention model in the elderly has been conducted in the pilot community, the Sa Kaew subdistrict, Tha Sala district, Nakhon Si Thammarat province, Thailand through participatory action research (PAR) with 3 phases, namely preparation, development, and evaluation. Each stage consists of four main steps: planning, action, observation, and reflection. The study was conducted from October 2019 to January 2021, which can be summarized and discussed as follows:

      1. Summary of Research

      2. Discussion and Interpretation of Findings

      3. Suggestion

1. Summary of Research

The researcher would like to present the results of the study according to the research framework, consisting of 3 phases, namely preparation, the development of a fall prevention model, and evaluation. The results of each phase are as follows:

1.1 The situation of falls among the elderly in the community southern Thailand

1.1.1 The prevalence of falls and related factors among elderly people

The study among 12,130 older adults found that the sample had a mean age of 71.22 (S.D. 8.49), with 59.8% females. At least one fell in the sample group by 12.1%. Fall-related factors include demographic characteristics, such as gender, age, educational background, marital status, and employment status. The health conditions factors had visual impairment, hearing problems, chronic diseases, activities of daily living (ADL), cognitive impairment, and balance problems. The behavioral factors included medication use, inadequate exercise, and assistive devices. Moreover, the environmental factors included an unsafe home environment, a bathroom outside the house, and Asian squat toilets. Based on multivariate logistic regression analysis, factors that had the power to predict the risk of falls from the highest to the lowest six months before the study were:

(1) The elderly who used more than three medications or at least one psychotropic medication, (2) balance problems, (3) the elderly in the semi-dependent group (ADL 5-11), (4) the cognitive impairment, (5) the bathrooms outside, (6) females had a higher risk of falls than males, (7) the vision impairment, (8) hearing problems, and (9) assistive devices. On the other hand, the elderly who still had jobs had a decreased risk of falls by 20%. In addition, to multivariate analysis, chronic conditions are likely to reduce the risk of falls by 30%.

1.1.2 Fall Prevention Policy and Current Operational Problems

A Characteristic of Thai health prevention policy implementation is generally set from the top of the government office to the operators in the community (top-down) approach. In addition, the operating guidelines in each area are different. For example, some operate according to the Bureau of Non-Communicable Diseases guidelines. Some implement following the Department of Medical Services standards for quality geriatric clinics, Ministry of Public Health. Some interventions are under the International Patient Safety Goals. However, there are still gaps in the coordination between provincial public health offices that determine the policy and the local administrative organizations that own the budget for activities in the community.

1.1.3 Fall prevention measures for the elderly in the Thai community

The IDIs and FGD showed that the community's fall prevention measures are unclear. However, there are guidelines for elderly care regarding fall prevention, including: 1) annual health screening and assessment for older people that include the screening of the Timed up and go Test and the question of the fall history in six-month 2) the multidisciplinary team from hospitals and the sub-district health-promoting hospitals visit the bedridden elders at home, and 3) The Local administration organizations establish and support activities in elderly clubs for promoting physical and mental health, indirectly effect to prevent Falls.

Although currently, Thai communities have activities related to falls among the elderly, namely, annual health screening. However, screening was not complete due to limitations on the number of staff, and screening for falls is not a key indicator in the organization's performance appraisal. In addition, when the screening data are available, the Sub-district Health-Promoting

Hospitals have not yet brought in risk groups to solve the problem and did not report the risks to the elderly and their family members. Therefore, there were no plans to implement programs to prevent falls for the elderly in the community. According to the Ministry of Public Health Policy, the sub-district has implemented a long-term care program for dependent groups. Unfortunately, there are no plans to prevent the elderly from becoming disabled and bedridden due to falls. Moreover, social activities were organized in all elders' clubs in each village. But there was no action to promote the knowledge and skill of preventing falls.

1.2 The study in the pilot community

1.2.1 The study on context of the pilot community

It was found that people in the community were ready regarding capital and potential to take care the elderly in the community. In the previous year, the community applied to participate in the project namely " The elderly care model development in southern region project." Therefore, due to the community's readiness in all aspects, it was chosen as a pilot community to develop a fall prevention model.

The stakeholders consist of various sectors, including family caregivers, village health volunteers, community leaders (sub-district and village headmen), the executive from Sub-district administrative organizations, and representatives from the elderly club, as well as healthcare providers from related sectors. The community has the capital and social potential to support the elderly's activities. The budget from Sub-district Administrative Organization and the Sub-district Health Security Fund are valuable resources for organizing activities. Currently, the elderly care activities in the community focus only on people with chronic diseases and dependency groups, while the healthy elderly concentrate on social activities in the elderly club, such as religious activities and handicrafts. In addition, there are several health promotions projects in sub-district health promoting hospitals. However, a project on fall prevention does not exist.

From the interview with stakeholders, the problem of implementing the community's activities related to the elderly which a lack of continuity due to unclear responsible persons.

When organizing activities in the community, there were a few to participate in since some elderly live in remote areas. In addition, they lose social participation due to a mission or physical conditions, such as house-ridden elderly or inconvenience in terms of time, transportation, family attitude, and personal attitude.

1.2.2 Problems in Implementing Fall Prevention Measures for the Elderly

There are 1,712 elder people in the Sa Kaew sub-district, representing 18.4% of the total population. In addition, there were older adults with dependency (ADL<12) 14.8%, and 29.1% had knee osteoarthritis. The situation of falls among the elderly 337 people found that 38.3% were at high risk of falls (Thai-FRAT risk score ≥4), 20.8% had a history of falls in the past six months, and 20.2% had a fear of falls. The hazardous environments in the community consist of road conditions, temple areas, public toilets in the SAO, health-promoting hospitals, and markets. While in home environments, there were slippery floors, the base of the house was of different levels. There are stairs, and bathrooms, which are without handrails, and a messy placement, and there are pets at home.

The data from the document and group discussion on fall prevention among community-dwelling older adults found that the community had an unclear fall prevention measure since stakeholders lacked the knowledge and understanding of fall prevention strategies. In addition, they lacked the fall prevention guidelines, speakers, a media to support and educate the elderly on fall prevention activities.

1.2.3 The circumstance of Falls in Sa Kaew Sub-district

The incidence of falls was 20.8%, and 58.6 percent were females. The elderly fell inside the house for 67.1%, often occurring during the day (08.00-15.59) for 50.0%, followed by in the evening (16.00-18.59) for 27.1%. Most falls (75.7%) were caused by tripping over cluttered things, followed by slipping due to wet floors, for 40.0%. In addition, 62.9 percent had post-fall injuries, and 12.9 percent required hospitalization due to severe injuries.

1.2.4 The Fall Preventive Behaviors of the Elderly

The results found that the overall level of behavior among the elderly was high. The elderly had Fall preventive behaviors at a high level of 40.0 %, followed by a low level of 33.3% and a moderate level of 26.7%. The top 3 good routine-practiced behaviors were 1) they do not drink alcohol, 96.8% 2) when feeling dizzy, stop doing activities immediately, 84.1%, 3) when feeling loss of balance will stop the movement and find a stable anchorage of 78.3%. The top three behaviors that elders did not practice consist of 1) regular exercise at least three times a week, 53.7%, 2) visiting the doctor when you have vision problems, 41.5%, and 3) visiting the doctor for an annual check-up, 24.6%.

1.2.5 Perception of Falls among the Elderly in the Community

An in-depth interview on the perception of falls among older people included:

1) The older adults were aware that (1) Falls could happen to all elderly due to aging deterioration of health. (2) The elderly fear falls because falls are unpredictable. (3) The elderly believe that falls are caused by their carelessness. (4) The elderly had perceived severity if they had experienced it before. (5) When a non-fatal fall occurs, the elderly tend to keep it secret from their family members since they fear it will raise family anxiety.

2) Public health officials were aware of falls among the elderly and intended to assess the risk of falls and would like to advise on fall prevention to all elderly. Still, there were limitations on the time and number of staff to provide services and a lack of media and equipment to educate them.

3) The village health volunteers were ready to participate in learning and volunteer spirit to assist in implementing the program in the community.

4) Community leaders were seriously interested in solving the problems of falls among the elderly. However, there was still a lack of knowledge and guidelines for fall prevention in their community.

5) For the self-fall prevention pattern among the elderly, most commented that self-care was the most important thing. Therefore, most people were ready to learn how to take

care of themselves to prevent falls; however, some elders still believed that falls are an accident that could always happen and cannot prevent.

1.3 The development of a fall prevention model

1.3.1 The Preparation before development

A community committee was appointed with clear roles and responsibilities. Developing the leadership team was the primary mechanism for driving fall prevention activities in the community through a workshop on knowledge of falls, fall risk assessment skills, exercise training skills, and home visit skills. The leadership team in the community consisted of 20 people, namely leaders of VHVs, a community nurse, and a representative of the Sa Kaew Subdistrict Administrative Organization.

1.3.2 A Model development: In this phase consisting of 2 activities as follows:

Activity 1: Participatory Meeting to Plan the Development of Fall Prevention Project.

A workshop on problem analysis in the area was held to set a development plan, using AIC (Appreciation-Influence-Control) technique.

1) The causes of problems of falls in the community: can be summarized by the causes as follows.

(1) Regarding the individual older adults consist of the health conditions and behaviors.

(2) Physical environment risk in both the home and community.

(3) Regarding the health service system, there was a lack of comprehensive screening and risk management.

(4) Regarding the lack of a campaign in the community.

(5) Regarding policy and budgets support preventive falls in the elderly.

2) The goals of the project: the involved committee proposing the goals of the project as follows:

(1) The community had potential and mechanisms for fall prevention.

(2) The elderly and their caregivers have an awareness of fall prevention.

(3) The elderly has better fall-preventive behaviors.

(4) The elderly in risk groups received risk management care.

(5) An effective fall prevention model is established in the community and can be practical.

3) The activities plan to achieve the goals: consisting of 2 parts as follows:

3.1) The proposal of a home-based multifactorial fall prevention program in older adults for 16 weeks coupled with exercise training, consisting of 4 activities:

(1) The workshop on educational and exercise training.

(2) Home visits to manage individual risk factors.

(3) Safety environment modification.

(4) Follow-up exercise training with elders and their caregivers at home.

3.2) The community activities with community campaign plans throughout the program, with a schedule of follow-up meetings on the performance once a month. In addition, the proposed actions were as follows:

(1) Screening for risk groups in the community.

(2) Promoting fall prevention knowledge and skills.

(3) Promoting exercise at home during epidemic situations.

(5) Campaigning for a Safe environment improvement.

(6) Ongoing awareness-raising campaign in the community.

4) Community involvement: The participation of working groups and community network partners was expressed in 71%. As a result, the meeting successfully drafted the model of development for preventing falls among the elderly.

Activity 2: **Fall Prevention Program for the Elderly in the Community.**

There were planned activities in the community for six months.

Action: The fall prevention program consists of 2 parts with details as follows:

1) Fall Prevention Activity in the Community

The fall Prevention Activity in the community operated with stakeholders in the community consists of comprehensive fall risk screening, installing vinyl banners at a significant point, promoted knowledge through the village´s radio once a week. The elderly clubs organized exercises. The Leaders of VHVs created activities in the chronic disease clinic. Multidisciplinary Visited homes of high-risk people with community networks.

(1) The number of homes at risk requiring correction was 46 out of 1,740 households.

(2) The overall level of participation among stakeholder in community was high.

2) Home-based Multifactorial Fall Prevention Program for the Elderly

The program was observed and recorded as follows:

(1) The participants reduced the duration of balance walking (tested by TUG test) after participating in the program with a statistical significance of <.001.

(2) The participants increased the mean times in 30-second chair stand after participating in the program with a statistical significance of <.001.

(3) The participants had an improved balance (tested by 4 Stage balance test) after participating in the program with a statistical significance of .05.

(4) The participants had a higher mean of fall prevention behavior scores after participating in the program, with a statistical significance of <.001.

(5) A Home visit found some elders necessary to consult a doctor. Some people required advice on medication, using a walking aid, exercises, and modifying a safe environment. It is also recommending practice exercise. Homes were needed to modify, some of them were supported by families. However, some houses required a budget from the local government. The most common hazards in homes include slippery areas, bathrooms without handrails, and stairs without railings.

(6) The satisfaction survey on a fall prevention program found the overall satisfaction level was high. The highest participants' satisfaction was the using appropriateness of media for self-exercise training and the follow-up support of the VHVs in the neighborhood. Moreover, satisfaction with the appropriate project formulation and obtaining knowledge about

the risk of falling themself also were high. In addition, the interviewees commented that they liked and wanted to participate in ongoing activities because they were more confident in exercising at home. When they have health problems and can consult with nurses or the village health volunteers that seem "close to home, close to the heart." They also were satisfied with the changes in physical health.

(7) The stakeholders cooperated, coordinated between sectors, jointly activities, and participated in every decision-making process. A committee monitored the operations and monthly meetings to report problems and work together continually.

3) Problems and solutions

The monthly meetings reported problems in the implementation included:

(1) There was still a lack of funding sources for improving the hazardous environment but a plan to coordinate those responsible for local fundraising

(2) Solving problems in communication between researchers, experts, community working groups, and the sample group during the covid-19 epidemic, the communication was through the application Line, and Zoom

(3) Some participants did not cooperate with the caregivers in practicing the exercise at home. Therefore, there must be a plan for the volunteers as a mentor to follow up until 16 weeks.

1.4 Evaluation phase

1.4.1 Lessons Learned among Stakeholders in the Pilot Community

It can be summarized as follows.

1) The key components of the model development including:

(1) Building strongly potential teamwork by collaborating between the community networks. They defined the roles and responsibilities clearly and developed the leaders' potential for fall prevention.

(2) Building awareness in the community by promoting knowledge on self-care for fall prevention, continuous public relations campaigns to create motivation, and community exercise campaigns.

(3) Sorting out the elderly with high-risk groups in the community by a fall-risk screening combined with an annual health screening and a history taking of falls whenever visiting the hospital.

(4) Individual multifactorial management in the high risk through home visiting.

(5) Surveillance of repeated a home-visiting for elderly who have fallen more than twice a year and monitoring the risks after home visits within 90 days.

(6) There was a responsible person in the working group that monitored, evaluated, and consulted the experts.

2) Success factors included:

(1) Integration of capital and resources so that the project's team can collaborate the fall prevention project with the previous elderly care project.

(2) The SAO had a budget for elderly care in the community.

(3) The academic knowledge was supported by a team of academics from Walailak University.

3) Problems and limitations in the implementation

(1) Some older people fear falling and usually avoid exercising.

(2) A modifying home environment lacked a sufficient budget.

(3) Implementation under the outbreak control caused the need to postpone the action plan several times.

4) What needs to develop

(1) Organizing campaigns to prevent falls among the elderly can cover all villages.

(2) Pushing the budget of the Sub-district Health Security Fund next year.

(3) Integrating a fall prevention program with the long-term care project.

(4) Supporting fall prevention campaigns in various activities of the elderly in the community.

(5) Developing a referral system for the elderly when injured in an accidental fall in the community.

(6) Developing a teleconsultation system between primary care units and specialists in cases of the severity of fall risk.

1.4.2 A Forum for Lessons Learned on the Fall Prevention Model

From a forum for lessons learned, the research team has concluded the fall prevention model for the elderly in the southern community with the following components:

1) Strong and high-potential community with four elements as follows:

(1) Cooperation from network partners consists of stakeholders, the elderly, and the locals.

(2) Defining the precise roles and responsibilities of the working team to drive the project and periodically evaluate it continuously.

(3) Potential leaders in fall prevention in the elderly.

(4) The fall prevention policy is clear, and funds are supported by the local administrative organization and other agencies.

2) Fortified awareness in the community

(1) promoting a knowledge activity.

(2) Public relations campaign in the community.

(3) people have sufficient access to information through various media.

3) Working collaborate with a community network consists of:

(1) Planning, implementation, and evaluation.

(2) Cooperation by network partners in the community

4) Guidelines for fall prevention in the community are as follows:

(1) Guideline for promoting awareness in the community every six months.

(2) Guideline for exercise in the elderly club

(3) The manual to improve the safe environment

(4) Guideline for fall screening in combination with the annual health assessment.

(5) Guidelines for surveillance of repeated falls in the high-risk group.

5) Success factors

The research team and experts completed lessons learned from the pilot community's success factors with the following elements:

(1) Participation of network partners with the common goal of developing guidelines for fall prevention for the elderly

(2) Strengthening knowledge on fall prevention according to the health belief model

(3) Organizing activities regardless of classroom activities due to limitations on sitting for a long time

(4) Periodic follow-up meetings of researchers and flexibility in program implementation plans

6) The problems in fall prevention measures

Nowadays, most communities in the southern region have difficulties with fall prevention implementation as follows:

(1) Personnel lack knowledge of fall prevention in the elderly.

(2) Most people still lack knowledge and awareness of fall prevention.

(3) For the policy, there is a lack of budget for fall prevention for the elderly in the community.

(4) The guidelines of fall screening in the elderly are unclear and complicated.

(5) There is a lack of media support to educate the elderly in the community on fall prevention.

(6) The elderly lack knowledge of fall prevention, and the elderly are unlike to participate in social activities in the elderly club.

(7) Responsible people in some communities lack an understanding of the relevant budget disbursement regulations for improving the environment in the home and community.

7) The Policy Recommendations

In the next phase of fall prevention among the elderly in Thai community as follows:

(1) The proposal for fall prevention for the elderly in the community as a continuous project for every five years.

(2) Planning for the development of a teleconsultation system in high-risk groups in the community.

(3) Designing a policy proposal with emphasis on proactive implementation and presenting a fall prevention model for the elderly in the community to the administrators of the local administrative organization and provincial public health for supporting budget, media, and speakers.

(4) There should integrate a fall prevention program with the project of long-term care for the elderly to sustainably implement the program.

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Anexos

1. Consentimiento informado

2. Instrumentos de recogida de datos

3. Actividades realizadas durante el programa

1. Consentimiento informado

CERTIFICATE OF ETHICAL APPROVAL

Human Research Ethics Committee of Walailak University

222 Thaiburi, Thasala District, Nakhon Si Thammarat 80160, Thailand

Project No. WU-EC-NA-4-050-62

Title of Project :

Development of Falls Prevention Model for Thai-Ederly in Community, Sounthern of Thailand

Approval Number :

WUEC-19-068-01

Principal Investigator :

Miss. Uraiwan Pantong

Official Address :

Banmaidang Promoting Hospital, Nakhon Si Thammarat 80160, Thailand

This Project has been approved for one year

From 17 May 2019 to 16 May 2020

The aforementioned project and informed consent have been reviewed and approved by Human

Research Ethics Committee, based on the Declaration of Helsinki

Signature ...... Chuchard Punsawad ......

(Associate Professor Chuchard Punsawad Ph.D)

Chairman of the Human Research Ethics Committee of Walailak University

Signature ...... S. Thamrong ......

(Professor Sombat Thamrongthanyawong Ph.D)

President of Walailak University

Approval Date 17 May 2019

2.   Instrumentos de recogida de datos

ภาคผนวก ข

เครื่องมือที่ใช้ในการรวบรวมข้อมูลการวิจัย

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แบบสอบถามสำหรับผู้สูงอายุ

คำแนะนำในการสัมภาษณ์ผู้ป่วย

1. เครื่องมือนี้ใช้สำหรับบันทึกข้อมูลของผู้สูงอายุ จากการสัมภาษณ์ มีทั้งหมด 8 ส่วน ดังนี้

    ส่วนที่ 1 ข้อมูลส่วนบุคคล

    ส่วนที่ 2 แบบประเมินความเสี่ยงต่อการหกล้มของผู้สูงอายุไทย (Thai FRAT)

    ส่วนที่ 3 แบบประเมินเกี่ยวกับการนึกคิดและการจำ Chula mental test : CMT

    ส่วนที่ 4 แบบประเมินความกลัวต่อการหกล้ม (Short FES-I)

    ส่วนที่ 5 แบบประเมินกิจวัตรประจำวัน ดัชนีบาร์เธลเอดีแอล

    ส่วนที่ 6 แบบประเมินพฤติกรรมเสี่ยงต่อการหกล้ม

    ส่วนที่ 7 ประเมินสิ่งแวดล้อมที่เป็นปัจจัยเสี่ยงต่อการหกล้ม

    ส่วนที่ 8 แบบประเมินสุขภาพทางกายองค์รวม

2. ก่อนเริ่มสัมภาษณ์ ผู้เก็บข้อมูล อ่านข้อความนี้ให้ผู้ป่วยฟัง

    กระผม/ดิฉัน จะสัมภาษณ์เกี่ยวกับการความเสี่ยงต่อการพลัดตกหกล้มของท่านในช่วง 6 เดือนที่ผ่านมาจนถึงวันนี้ และขอให้ตอบสิ่งที่เกิดขึ้นตามจริงทุกครั้งที่ กระผม/ดิฉัน อ่านข้อคำถามแต่ละข้อเสร็จแล้ว ก็จะอ่านตัวเลือกคำตอบให้ ฟัง จากนั้นก็ขอให้ท่านเลือกว่าคำตอบใดที่ตรงมากที่สุดกับสิ่งที่ท่านได้ปฏิบัติในช่วง 1 เดือนที่ผ่านมา..."

    ทุกครั้งที่กระผม/ดิฉัน อ่านข้อคำถามแต่ละข้อเสร็จแล้ว ก็จะอ่านตัวเลือกคำตอบให้ฟัง จากนั้นก็ขอให้ท่านเลือกว่าคำตอบใดที่ตรงมากที่สุด

3. ขอให้ผู้เก็บข้อมูลอ่านคำถามแต่ละข้ออย่างช้า ๆ เมื่ออ่านข้อคำถามเสร็จแล้ว ให้เว้นช่วงเวลาเล็กน้อยก่อนจะอ่านตัวเลือกคำตอบให้ผู้ป่วยฟัง หากผู้ป่วยไม่เข้าใจข้อคำถามขอให้ท่านอ่านทวนคำถามใหม่โดยไม่ต้องอธิบายขยายความ

4. เมื่อสัมภาษณ์คำถามชุดนี้เสร็จแล้ว ให้เวลาผู้ป่วยพัก 4-5 นาทีหรือตามที่ต้องการ หลังจากนั้นจะประเมินการตรวจร่างกาย หรือหากผู้ป่วยต้องการหยุดพักไม่เวลาในเวลาใดก็ตามก็สามารถทำได้ทันที ขอให้ผู้เก็บข้อมูลรอจนกว่าผู้ป่วยจะพร้อม หรือนัดหมายวัน เวลาและสถานที่ในการสัมภาษณ์ครั้งต่อไป

แบบสอบถามที่ได้คำตอบไม่ครบถ้วนจะไม่สามารถนำไปวิเคราะห์ข้อมูลได้

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แบบสอบถามการหกล้มและปัจจัยเสี่ยงต่อการเกิดการหกล้ม

ส่วนที่ 1 ข้อมูลทั่วไป

คำชี้แจง โปรดทำเครื่องหมาย √ ลงใน ( ) ที่ตรงกับคำตอบของท่านมากที่สุด และเติมคำลงในช่องว่างให้ครบถ้วน

1. เพศ........................

2. อายุ............................ปี

3. สภาพสมรส ()1. โสด () 2. คู่ () 3. หม้าย/หย่า/แยก

4. ระดับการศึกษา () 1. ไม่ได้เรียน () 2. ประถมศึกษา () 3. สูงกว่าประถมศึกษา

5. อาชีพ () 1. ไม่มีอาชีพ () 2. ค้าขาย () 3. เกษตรกรรม () 4. อื่น ๆ

6. แหล่งที่มาของรายได้ (ตอบได้มากกว่า 1 ข้อ..
    รายได้เฉลี่ยต่อเดื่อน............................บาท

7. สมาชิกในครอบครัวจำนวน........................คน

8. ท่านมีโรคประจำตัว ต่อไปนี้หรือไม่ (ตอบได้มากกว่า 1 ข้อ)

( ) 1. ความดันโลหิตสูง ( ) 2. เบาหวาน ( ) 3.ไขมันในเลือดสูง ( ) 4.โรคกระดูกและข้อ ( ) 5.โรคหัวใจ ระบุชนิด
.... ( ) 6. อื่น ๆ ระบุ ....

9. ท่านรับประทานยาเหล่านี้หรือไม่ (ตอบได้มากกว่า 1 ข้อ)

( ) 1. ยานอนหลับ ชื่อยา/ ขนาดที่รับประทาน ....( ) 2. ยากล่อมประสาท ชื่อยา/ ขนาดที่รับประทาน ....( ) 3. ยาลดความดันโลหิต ชื่อยา/ ขนาดที่รับประทาน .... ( ) 4. ยาขับปัสสาวะ ชื่อยา/ขนาดที่รับประทาน .... ( ) 5. ยาเบาหวาน ชื่อยา/ ขนาดที่รับประทาน…………………………....( ) 6. ยาสมุนไพร ชื่อยา/ ขนาดที่รับประทาน…………………………............... ( ) 7. ยาดองเหล้า ชื่อยา/ ขนาดที่รับประทาน.......................( ) 8. ยาอื่น ๆ ชื่อยา/ขนาดที่รับประทาน..............................

10. เป็นสมาชิกกลุ่ม/ชมรม ๆ และเข้าร่วมกิจกรรมต่อเนื่อง   ( ) 1.ใช่ ( ) 2. ไม่ใช่

ปัจจัยเสี่ยง	คะแนน
1.เพศ	
....หญิง	1
.....ชาย	0
2.การมองเห็นบกพร่อง	
...ไม่สามารถอ่านตัวเลขที่ระยะ 6/12 เมตรได้มากกว่าครึ่ง	1
...อ่านตัวเลขที่ระยะ 6/12 เมตรได้มากกว่าครึ่ง	0
3.การทรงตัวบกพร่อง	
...ยืนต่อเท้าเป็นเส้นตรงไม่ได้ หรือยืนได้ไม่ถึง 10 วินาที	2
...ยืนต่อเท้าเป็นเส้นตรงได้นานเกิน 10 วินาที	0
4.การใช้ยา	
...กินยาต่อไปนี้ตั้งแต่ 1 ชนิดขึ้นไป ได้แก่ยานอนหลับ ยากล่อมประสาท ยาลดความดันโลหิต ยาขับปัสสาวะ หรือกินยาชนิดใดก็ได้ 4 ชนิดขึ้นไป (ไม่รวมวิตามิน)	1
...ไม่กินยาต่อไปนี้ตั้งแต่ 1 ชนิดขึ้นไป ได้แก่ยานอนหลับ ยากล่อมประสาท ยาลดความดันโลหิต ยาขับปัสสาวะ หรือกินยาชนิดใดก็ได้ 4 ชนิดขึ้นไป	0
5.ประวัติการหกล้ม	
...มีประวัติหกล้มตั้งแต่ 2 ครั้งขึ้นไปในรอบ 6 เดือนที่ผ่านมา	5
...ไม่มี	0

6. สภาพบ้านที่อยู่อาศัย	
...อยู่บ้านยกพื้นสูงตั้งแต่ 1.5 เมตรขึ้นไป หรือบ้านสองชั้นต้องขึ้นลงโดยใช้บันได	1
...ไม่อยู่บ้านลักษณะดังกล่าว	0
สรุปคะแนน ☐ 0-4 คะแนน = ไม่เสี่ยงล้ม ☐ 4-11 คะแนน = เสี่ยงล้ม	

ส่วนที่ 3 แบบทดสอบสภาพจิต การนึกคิดและการจำ (Chula mental test : CMT)

คำถาม	คำตอบ	คะแนน	ได้
1. ปีนี้คุณอายุเท่าใด		1/0	
2. ขณะนี้กี่โมง	(อาจตอบคลาดเคลื่อนได้ 1 ชั่วโมง)	1/0	
3. พูดว่า "กะทะ" "ร่ม" "ประตู" ให้ฟังช้าๆ ชัดๆ 2 ครั้ง แล้วให้ผู้สูงอายุทวนชื่อทั้งสาม**ทันที** (ชื่อที่ถูก 1 ชื่อ = 1 คะแนน)	ร่ม	1/0	
	กะทะ	1/0	
	ประตู	1/0	
4. เดือนนี้เดือนอะไร		1/0	
5. คนนั้นเป็นใคร	บุคคลที่ 1	1/0	
(ให้ถามถึง 2 คน)	บุคคลที่ 2	1/0	
6. ข้าว 1 ถังมีกี่ลิตร / กี่กิโลกรัม	20 ลิตร / 15 กิโลกรัม	1/0	
7. ให้ผู้สูงอายุทำตามคำสั่งที่จะบอกต่อไปนี้ "ให้ตบมือ 3 ครั้ง แล้วกอดอก"	ให้ 1 คะแนนถ้าทำถูกขั้นตอน	1/0	
8. จงบอกความหมายของสุภาษิตต่อไปนี้"หนีเสือปะจรเข้" คำตอบที่ถูกต้อง 1. หนีจากสิ่งที่ไม่ดีไปพบสิ่งที่ไม่ดีอีก 2. หนีจากสถานการณ์อันตรายไปพบกับสถานการณ์หรือ บุคคลอันตรายอีก		1/0	
9. บอกให้ผู้สูงอายุฟังประโยคต่อไปนี้ให้ดี เมื่อฟังจบแล้วให้พูดตามทันที **"ฉันชอบดอกไม้ เสียงเพลง แต่ไม่ชอบหมา"**	ให้ 1 คะแนนถ้าพูดถูกต้องตามลำดับทั้งประโยค	1/0	
10. ถามผู้สูงอายุว่า "ถ้าลืมกุญแจบ้านจะทำอย่างไร"	ให้ 1 คะแนนถ้ามีเหตุผลเหมาะสมโดยแสดงถึงความพยายามในการแก้ไขปัญหา เช่น	1/0	

	ตามช่างกุญแจมา, ไปขอกุญแจแม่ที่ญาติ หรือขอความช่วยเหลือจากเพื่อนบ้าน		
11. บอกให้ผู้สูงอายุนับเลขจาก 10-20	ให้ 1 คะแนนถ้านับได้ถูกต้องตามลำดับ	1/0	
12. ชี้ไปที่นาฬิกา แล้วถามว่า คืออะไร/ เรียกว่าอะไร		1/0	
ชี้ไปที่ปากกา แล้วถามว่า คืออะไร / เรียกว่าอะไร		1/0	
13. บอกให้ผู้สูงอายุลบเลขที่ละ 3 จาก 20 ทั้งหมด 3 ครั้ง 20 – 30 = ... 17 – 3 = ... 14 – 3 = ...	ให้คะแนนตามตัวเลขที่ลบได้ถูกต้อง 1/0 1/0 1/0		
		คะแนนรวม	
การแปลผล (คะแนนเต็ม = **19** ถ้า ต่ำกว่า 15 แสดงว่าผู้สูงอายุมีความผิดปกติของ Cognitive function)			

4 Fear of falling

แบบสอบถาม ถามว่าท่านมีความกังวลอย่างไรต่อความเป็นไปได้ที่จะหกล้ม กรุณาตอบคำถามโดยคำนึงว่าโดยปกติท่านทำกิจกรรมเหล่านี้อย่างไร หากปัจจุบันท่านไม่ได้ทำกิจกรรมเหล่านี้ด้วยตัวเองกรุณาตอบคำถามว่าท่านมีความกังวลอย่างไรเกี่ยวกับการหกล้ม ถ้าท่านทำกิจกรรมเหล่านี้ด้วยตัวเอง สำหรับกิจกรรมดังต่อไปนี้กรุณาทำเครื่องหมาย (✔) ในช่องสี่เหลี่ยมที่ใกล้เคียงมากที่สุดกับความเห็นของท่านในเรื่องความกังวลว่าอาจจะหกล้ม หากท่านทำกิจกรรมเหล่านี้

	กิจกรรม	ไม่กังวลหรือ ไม่กลัว 1	กังวลหรือกลัว เล็กน้อย 2	กังวลหรือกลัว ปานกลาง 3	กังวลหรือกลัว มาก 4
1	การใส่หรือถอดเสื้อผา	1 ☐	2 ☐	3 ☐	4 ☐
2	การอาบน้ำ	1 ☐	2 ☐	3 ☐	4 ☐
3	การนั่ง หรือลุกจากเก้าอี้	1 ☐	2 ☐	3 ☐	4 ☐
4	การขึ้นหรือลงบันได	1 ☐	2 ☐	3 ☐	4 ☐
5	การเอื้อมหยิบ ของเหนือศีรษะ หรือก้มลงเก็บของบนพื้น	1 ☐	2 ☐	3 ☐	4 ☐
6	การเดินขึ้นหรือลงที่ลาดชัน	1 ☐	2 ☐	3 ☐	4 ☐

กิจวัตรประจำวัน	คะแนน	การปฏิบัติได้	วันที่	วันที่
	1 คะแนน	ต้องใช้คนช่วยพยุง		
	2 คะแนน	ต้องช่วยพยุงเล็กน้อย		
	3 คะแนน	ทำได้เอง		
4.การใช้ห้องน้ำ (Toilet)	0 คะแนน	ช่วยตัวเองไม่ได้		
	1 คะแนน	ทำได้เอง		
	2 คะแนน	ช่วยตัวเองได้ดี		
5.การเคลื่อนที่ภายในห้องหรือบ้าน	0 คะแนน	เคลื่อนที่ไปไหนไม่ได้		
	1 คะแนน	ต้องใช้รถเข็น		
	2 คะแนน	ต้องมีคนพยุง		
	3 คะแนน	เคลื่อนที่ได้เอง		
6.การสวมใส่เสื้อผ้า (Dressing)	0 คะแนน	ต้องมีคนสวมใส่ให้		
	1 คะแนน	ช่วยตัวเองได้ % 50		
	2 คะแนน	ช่วยตัวเองได้ดี		
7.การขึ้นลงบันได 1 ขั้น(Stair)	0 คะแนน	ไม่สามารถทำได้		
	1 คะแนน	ต้องการคนช่วย		
	2 คะแนน	ขึ้นลงได้เอง		
8.การอาบน้ำ (Bathing)	คะแนน 0	ต้องมีคนช่วยหรือทำให้		
	คะแนน 1	อาบน้ำเอง		
9.การกลั้นถ่ายอุจจาระ (Bowel)	คะแนน 0	กลั้นไม่ได้หรือต้องสวนเสมอ		
	คะแนน 1	กลั้นไม่ได้บางครั้ง		
	คะแนน 2	กลั้นได้ปกติ		
10.การกลั้นปัสสาวะ (Bladder)	คะแนน 0	กลั้นไม่ได้ หรือใส่สายสวน		
	คะแนน 1	กลั้นไม่ได้บางครั้ง		
	คะแนน 2	กลั้นได้ปกติ		
		คะแนนรวม		
		อยู่ในกลุ่ม		

(   ) คะแนน 0-4   แปลว่า มีภาวะพึ่งพาโดยสมบูรณ์   กลุ่ม ติดเตียง

(   ) คะแนน 8-5   แปลว่า มีภาวะพึ่งพารุนแรง   กลุ่มติดบ้าน

(   ) คะแนน 9-11   แปลว่า มีภาวะพึ่งพาปานกลาง   กลุ่มติดบ้าน

(   ) คะแนน +12   แปลว่า ไม่มีภาวะพึ่งพา   กลุ่มติดสังคม

ส่วนที่ 6 แบบสอบถามพฤติกรรมการป้องกันการหกล้มของผู้สูงอายุ

(Questionnaire Fall prevention behaviors)

คำชี้แจง แบบสอบถามเกี่ยวกับพฤติกรรมการป้องกันการพลัดตกหกล้มของผู้สูงอายุซึ่งแบ่งออกเป็นการพลัดตกหกล้มของท่าน

ประกอบด้วยข้อคำถามจำนวน 25 ข้อ โดยผู้สัมภาษณ์จะอ่านคำถามอย่างช้า ๆ

ให้ผู้สูงอายุทีละข้อแล้วให้ท่านบอกคำตอบที่ตรงกับความจริงท่าน และผู้สัมภาษณ์จะเป็นผู้กา

คำตอบที่ท่านต้องการ

เกณฑ์คำตอบ

ปฏิบัติประจำ หมายถึง กระทำเป็นประจำหรือบ่อยมากกว่า 4 วันต่อสัปดาห์ ให้คะแนนข้อละ 3 คะแนน

ปฏิบัติบางครั้ง หมายถึงกระทำเป็นส่วนน้อย หรือนาน ๆ ครั้ง ให้คะแนนข้อละ 2 คะแนน

ไม่เคยปฏิบัติ หมายถึง ไม่เคยกระทำ ให้คะแนนข้อละ 1 คะแนน

Item	Fall prevention behaviors	Routine	Sometime	Never	Mark
	About internal factors				
1	When you feel unbalanced, you stop moving and find a stable anchorage.				
2	Careful about doing activities both inside and outside the home.				
3	When feeling dizzy, you stop doing activities immediately.				
4	Regular exercise for 30 minutes at least three times a week.				
5	You will see your doctor for a checkup when you have vision problems.				
6	Visiting the doctor for an annual physical examination.				
7	Taking calcium-rich foods such as milk and small fish to strengthen bones.				
8	Do not drink alcohol.				

9	Take the medication as your doctor prescribed, do not stop, or adjust the dose yourself.				
10	Standing up or moving Slowly, with confidence, not in a hurry				
	About external factors				
11	Wear clothes that fit and are not too long.				
12	Check up on the stability of the furniture, such as tables, chairs, and beds.				
13	When you find the floor wet, you will hurry to dry it immediately.				
14	The light inside and around the house is sufficient both day and night.				
15	Lights are turned on at night to provide adequate lighting in bathrooms and paths.				
16	You do not wear socks while walking inside the house.				
17	You and your family help arrange the items in the house orderly without obstacles.				
18	When walking and moving, you always look at the ground first.				

x

19	You walk carefully or avoid cross-level walkways, rough floors, or slippery wet floors.				
20	As you go up and down the stairs, you always use your hand to hold at least one handrail on either side.				
21	When using the bathroom, or toilet, you will hold the handrail or handle.				
22	Using stable chairs or stairs when picking up things above eye level.				
23	Wearing appropriate shoes				
24	Do not allow pets to run and play in the house.				
25	Avoid lifting large object or many objects.				

ส่วนที่ 7 ประเมินสิ่งแวดล้อมที่เป็นปัจจัยเสี่ยงต่อการหกล้ม

คำชี้แจง : โปรดใส่เครื่องหมาย √ ในช่องที่ตรงกับความรู้สึกของท่านมากที่สุด

1. ลักษณะที่อยู่อาศัย	☐ บ้านชั้นเดียว บ้าน 2 ชั้น ☐ บ้านชั้นเดียวใต้ถุนสูง อื่นๆ ....
2. บริเวณบ้าน ทางเดิน	สิ่งกีดขวาง ของระเกะระกะ พื้นขรุขระ เสี่ยงต่อการสะดุด ทางลาด แสงสว่างไม่เพียงพอ
3. ห้องนอน	นอนพื้น นอนเตียงนอน สิ่งกีดขวาง ของระเกะระกะ แสงสว่างไม่เพียงพอ
4. ห้องนอนของท่านอยู่ชั้น	☐ ชั้นล่าง ☐ ชั้นบน
5. ห้องครัว	พื้นลื่น สิ่งกีดขวาง ของระเกะระกะ แสงสว่างไม่เพียงพอ
6. ห้องน้ำ (ที่ใช้ประจำ)	6.1 ที่ตั้ง ภายในบ้าน ชั้น 1 ชั้น 2 ภายนอกบ้าน 6.2 ลักษณะโถส้วม โถนั่ง/ชักโครก ส้วมนั่งยอง 6.3 พื้นห้องน้ำ พื้นไม่ลื่น ☐ พื้นลื่น 6.4 ราวจับในห้องน้ำ ☐ มีราวจับ ไม่มีราวจับ 6.5 แสงสว่างภายในห้องน้ำเพียงพอหรือไม่ ☐ เพียงพอ ☐ไม่เพียงพอ
7.บันได	☐ ไม่มีบันได (ข้ามไปตอบข้อที่ 8)
	☐ มีบันได

	ไม่มีราวจับ สิ่งกีดขวาง ของระเกะระกะ แสงสว่างไม่เพียงพอ
8.ขอบธรณีประตู/พื้นต่างระดับที่สังเกตยากหรือไม่	☐ไม่มี ☐ มี
9. ลักษณะพื้นบ้าน	☐ ไม่ลื่น ☐ ลื่น
10.การจัดวางสิ่งของ/เฟอร์นิเจอร์ภายในบ้าน	☐ เป็นระเบียบ ☐ ไม่เป็นระเบียบ เกะกะกีดขวางทางเดิน
11. แสงสว่างภายในบ้าน	☐ มีเพียงพอ มองเห็นชัด ☐ ไม่เพียงพอ/ แสงสลัว มองไม่ชัด
12. มีสัตว์เลี้ยงภายในบ้าน	☐ ไม่มี ☐ มี
13.ลักษณะบริเวณรอบๆ บ้าน	☐ พื้นไม่ขรุขระไม่เป็นหลุม/เป็นบ่อ ☐ พื้นเปียก/ขรุขระไม่เป็นหลุม/เป็นบ่อ
สรุปความเสี่ยงด้านสิ่งแวดล้อม...	

ส่วนที่ 8 แบบประเมินสุขภาพทางกายแบบองค์รวม

ความสามารถ	การทดสอบ	ผลการตรวจ	เกณฑ์ปกติ	การแปรผล
1. ดัชนีมวล กาย ดัชนีมวลกาย= น้ำหนัก (กก.)/ ส่วนสูง (ม.)2	ชั่งน้ำหนัก และ วัด ส่วนสูง	น้ำหนัก ....กก. ส่วนสูง ......ซม. ดัชนีมวลกาย ....กก. /เมตร2	18.5–24.9 กิโลกรัม/เมตร2	* ผอม * ปกติ * น้ำหนักเกิน
3. สัดส่วนรอบ เอว	วัดเส้นรอบเอว	.... เซนติเมตร	ชาย น้อยกว่า 90 cm หญิง น้อยกว่า 80 cm	( ) ผ่าน ( ) ไม่ผ่าน
4. การลุกนั่งจากเก้าอี้ใน 30 วินาที (30	ลุกนั่งใน 30 วินาที		12-18 ครั้ง	( ) ผ่าน ( ) ไม่ผ่าน

ความสามารถ	การทดสอบ	ผลการตรวจ	เกณฑ์ปกติ	การแปรผล
second Chair Stand)				
5.การทรงตัว (TUG) (วินาที)	ลุก – เดิน – นั่ง ไป กลับ 3 เมตร (วินาที)	--------------------วินาที	< 13 วินาที	( ) ผ่าน ( ) ไม่ผ่าน
6.การมองเห็น ทดสอบด้วย Snellen chart	1) ระยะ6 เมตร ผู้คัดกรองชู นิ้ว 3 นิ้ว 2) ระยะ 3เมตร ผู้คัดกรองชู นิ้ว 3 นิ้ว	1) มองเห็น /ไม่เห็น (ซ้าย/ขวา) 2.1) มองเห็น (ซ้าย/ขวา) 2.2) มองไม่เห็น	1) อ่านได้ที่ระยะ 6 เมตร20/20 2.1) อ่านได้ที่ระยะ 3 เมตร20/20 2.2) อ่านไม่ได้ที่ระยะ 3 เมตร20/20	() ปกติ () ผิดปกติ 2.1สงสัยต้อกระจก 2.2สงสัยต้อกระจกชนิ ดบอด
7. การกลั้นปัสสาวะไม่ได้	สอบถาม	1.ปกติ 2. ปัสสาวะเล็ดเวลาไอ/จาม 3. ปัสสาวะบ่อย> 7 ครั้ง/วัน	สามารถกลั้นควบคุมการขับถ่ายปัสสาวะได้	() ปกติ () ผิดปกติ
8. ประเมินข้อเข่าเสื่อม	สังเกต การตรวจ เคาะ คลำ	มีอาการปวดเข่าหรือไม่ 1.ข้อเข่าฝืดตึงหลังตื่นนอนเข้านาน 30 นาที 2.เสียงดังกรอบแกรบในข้อเข่าขณะเ คลื่อนไหว 3.กดเจ็บที่กระดูก 4.ข้อใหญ่ผิดรูป 5. ไม่พบข้ออุ่น	1.ถ้าตอบปวดเข่ามีความเสี่ยงหรือแนวโน้มเป็นโรค ข้อเข่าเสื่อม 2.ถ้ามีอาการปวดเข่าและตอบว่า "ใช่" 2 ข้อ มีโอกาสเป็นโรคข้อเข่าเสื่อม ส่งต่อแพทย์	() ปกติ () ผิดปกติ
9. ประเมินลักษณะเท้าผิด ปกติ/ ใช้เครื่องช่วยเดิน	สังเกตุ	ปกติ/ผิดปกติ		

ครั้งที่/สัปดาห์	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ว.ด.ป.																		
การติดตาม	เยี่ยม	เยี่ยม	อสม.	โทร	อสม.	โทร	อสม.	โทร	อสม	โทร.	อสม	โทร	อสม	โทร	อสม	โทร		
จำนวนการล้ม ในเดือนนี้																		
การออกกำลังกาย																		
การเตรียมร่างกาย 4 ท่า ท่าละ 10 ครั้ง (√ (ทำ) × (ไม่ทำ))																		
ท่าบริหารศีรษะ																		
ท่าบริหารคอ																		
ท่ายืดหลัง																		
ท่าบริหารลำตัว																		
การฝึกความแข็งแรงของกล้ามเนื้อ (ทำซ้ำข้างละ 10 ครั้งในแต่ละท่า และ/หรือ การเพิ่มการถ่วงน้ำหนัก) : ครั้ง/น้ำหนัก (กก.)																		
บริหารกล้ามเนื้อต้นขาหน้า																		
บริหารกล้ามเนื้อต้น ขาหลัง																		
บริหารสะโพกด้านข้าง																		
ยืนด้วยปลายเท้า																		

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ยืนด้วยส้นเท้า																		
ครั้งที่/สัปดาห์	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ว.ด.ป.																		
การฝึกการทรงตัว :ใช้ราวจับ หรือไม่ใช้ราวจับ (ทำซ้ำ 10 ครั้ง /ระยะเวลาต่อครั้งอย่างน้อย 10 วินาที) : ครั้ง/เวลา (วินาที)																		
ท่าย่อเข่า																		
ท่าเดินเลข 8																		
ท่ายืนต่อเท้าครั้งละ 30วินาที																		
ยืนต่อเท้านาน 30วินาที																		
เดินต่อเท้า 10 เก้า																		
ยืนขาเดียว 10 วินาที																		
เดินด้วยส้นเท้า10 ก้าว																		
เดินด้วยปลายเท้า 10 ก้าว																		

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| ID | | | | | | | | | | .... | | | | | CODE | [ ][ ][ ][ ] | |

การฝึกการเดิน (นาที/ครั้ง/วัน และ ครั้ง/สัปดาห์)																	
เดินพื้นราบ																	
เดินขึ้นลงบันได 1 ขั้น																	

เครื่องมือบันทึกติดตามเยี่ยมบ้านการออกกำลังกายที่บ้าน 16 สัปดาห์

การติดตามเยี่ยมผู้สูงอายุสัปดาห์ละ 1 ครั้ง

แบบประเมินติดตามผลลัพธ์โปรแกรมการพลัดตกหกล้มในชุมชนก่อนเข้าร่วมโปรแกรม และหลังเข้าร่วมโปรแกรม 16 สัปดาห์

<div align="center">

แบบประเมินติดตามผลลัพธ์โปรแกรมการพลัดตกหกล้มในชุมชน
ความแข็งแรงกล้ามเนื้อและการทรงตัวของผู้สูงอายุ

</div>

การทดสอบ	ระยะก่อนเข้าโปรแกรม	1 เดือน	2 เดือน	4 เดือน
อุบัติการณ์การหกล้ม จำนวน (ร้อยละ)				
การเดิน และการทรงตัวของผู้สูงอายุ				

Time Up and Go Test ระยะเวลาที่ทำได้ต่อครั้ง(วินาที)																
ความแข็งแรงกล้ามเนื้อ																
30-second Chair Stand (ครั้ง)																
Four-Stage Balance Test ในแต่ละท่า 10วินาทีใช้ราวจับ (×ใช้/×ไม่ใช้/0ทำไม่ได้)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

หมายเหตุ
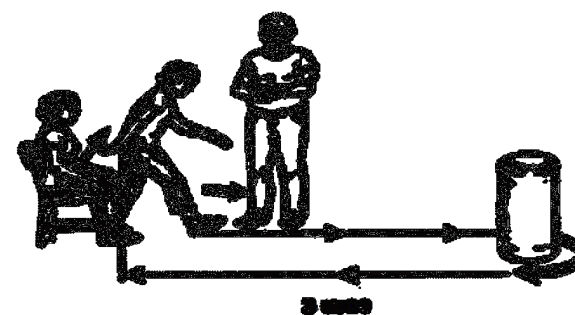
1. การเดินและกลับตัว 3 เมตร (Timed Up and Go Test: TUG)

อุปกรณ์ที่ใช้กรวยจราจร ตลับเมตร นาฬิกาจับเวลา เก้าอี้ที่มีพนักพิง

วิธีการทดสอบ

1) ผู้ถูกทดสอบนั่งบนเก้าอี้ทดสอบ เมื่อได้ยินคำสั่ง "เริ่ม" ให้ลุกขึ้นยืนและเดินด้วย ความเร็วสูงสุดแต่ปลอดภัยเป็นระยะทาง 3 เมตร และหมุนตัวอ้อมกรวยกลับมา นั่งที่เดิม

2) ผู้ทดสอบคอยเดินตามเพื่อระวังความปลอดภัย โดยเริ่มจับเวลาเมื่อได้ยินคำสั่ง "เริ่ม" และหยุดเวลาเมื่อหลังของผู้สูงอายุพิงพนักเก้าอี้ บันทึกเวลาเป็นวินาที * ค่าน้อยที่สุดที่เห็นการเปลี่ยนแปลง เท่ากับ 4 วินาที; ถ้าใช้ระยะเวลาการเดินไปกลับมากกว่า 13.5 วินาที แสดงว่ามีความเสี่ยงสูงต่อการหกล้ม

3) ทำการทดสอบ 2 ครั้ง และนำเวลาที่ทดสอบทั้ง 2 ครั้งมาหาค่าเฉลี่ย

Mangione KK, Craik RL, McCormick AA, Blevins HL, White MB, Sullivan-Marx EM, et al. (2010). Detectable changes in physical performance measures in elderly African Americans. Phys Ther,90, 921-7.

2. การลุกนั่ง (30 second Chair Stand) เพื่อประเมินความแข็งแรงกล้ามเนื้อร่างกายส่วนล่าง (lower body strength)
อุปกรณ์ที่ใช้นาฬิกาจับเวลา และเก้าอี้ที่มีพนักพิงหลัง
วิธีการทดสอบ
1) วางเก้าอี้ที่ใช้ในการทดสอบชิดกำแพงหรือผนัง เพื่อความมั่นคงขณะทดสอบ
2) ผู้ถูกทดสอบนั่งตัวตรงบนเก้าอี้ วางเท้าชิดบนพื้น และวางมือบนไหล่ด้านตรงกันข้ามทั้ง 2 ข้างสลับกัน
3) ผู้ถูกทดสอบลุกขึ้นยืนเหยียดตัวให้สุดแล้วนั่งลง ติดต่อกันให้เร็ว ที่สุดและปลอดภัย โดยให้หลังพิงพนักเฉพาะครั้งแรกและครั้งสุดท้าย จับเวลา
เมื่อได้ยินคำสั่ง "เริ่ม" และหยุดเมื่อเวลาครบ 30 วินาที นับจำนวนครั้งที่ยืนได้สุด (ค่าปกติ= 12-18 ครั้ง) ; ถ้าต่ำกว่า 12
ครั้งแสดงว่ามีความเสี่ยงสูงต่อการหกล้ม
 Rikli & Jones, 2001; National Council on the Aging, 2004.
3. **Four-Stage Balance Test** การทดสอบการทรงตัว
อุปกรณ์ที่ใช้นาฬิกาจับเวลา
วิธีการทดสอบ ยืนในแต่ละท่านาน 10 วินาที **ใช้ราวจับ (ใช้/ไม่ใช้/ทำไม่ได้)**

ท่าที่ 1 ยืนให้เท้า 2 ข้างเสมอกัน	ท่าที่ 2 ยืนวางเท้าด้านหนึ่งให้สัมผัสปลายนิ้วโป้งอีกข้างหนึ่ง	ท่าที่ 3 ยืนให้ปลายเท้าข้างหนึ่งสัมผัสส้นเท้าอีกข้างหนึ่ง	ท่าที่ 4 ยืนด้วยเท้าเดียว

วิธีการทดสอบการทรงตัว ได้แก่ การยืนเท้าชิดกัน (Side by side stand) การยืนต่อเท้าทั้งหมด (Full tandem stand) การยืนต่อเท้าครึ่งหนึ่ง (Semi tandem stand) และ การยืนขาเดียว (One leg stand) โดยหากไม่สามารถยืนได้หรือยืนได้น้อยกว่า 10 วินาที ถือว่ามีปัญหาการทรงตัว เสี่ยงต่อการหกล้ม

แบบประเมินความพึงพอใจการเข้าร่วมโครงการป้องกันการพลัดตกหกล้มในชุมชน

Satisfaction Assessment Form

คำชี้แจง โปรดระบุระดับความพึงพอใจของท่านโดยทำเครื่องหมาย ☑ ในหัวข้อต่อไปนี้

☐ ระดับมากที่สุดเท่ากับ 5 คะแนน   ☐ ระดับมากเท่ากับ 4 คะแนน   ☐ ระดับปานกลางเท่ากับ 3 คะแนน

☐ ระดับน้อยเท่ากับ 2 คะแนน   ☐ ระดับน้อยที่สุด เท่ากับ 1 คะแนน

	Assessment topic	Satisfaction level				
		5	4	3	2	1
1	Recognizing information about the project					
2	Appropriateness of the project formulation					
3	Obtaining information about the risk of falling yourself					
4	Obtaining information on actions to prevent falls					
5	Educating from the speakers in the project					
6	Opportunity to ask questions or participate in activities					
7	Appropriateness of media used for self-exercise training					
8	Follow-up support of the village health volunteers in the neighborhood					
9	The knowledge gained from the project can be put into practice					
10	Your satisfaction with the overall project					

เครื่องมือที่ใช้ในการเก็บรวบรวมข้อมูล

Tools for Collecting Information

โครงการวิจัย "การพัฒนารูปแบบการป้องกันภาวะหกล้มของผู้สูงอายุไทยในชุมชนภาคใต้"

แนวคำถามกึ่งโครงสร้างเพื่อการสัมภาษณ์ และสนทนากลุ่มผู้มีส่วนได้ส่วนเสียในชุมชน

Open-end questions for interview and focus group

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คำชี้แจง (Explanation)

แนวคำถามนี้สำหรับใช้เป็นแนวทางการสัมภาษณ์และสนทนากลุ่มในบุคคล กลุ่มคน ดังต่อไปนี้

1) สมาชิกของ ทีมพัฒนารูปแบบการป้องกันภาวะหกล้มของผู้สูงอายุในชุมชนซึ่งประกอบด้วย

        1.1) ทีมตัวแทนจาก อปท.

        1.2) เจ้าหน้าที่จาก รพ.สต. (พยาบาล/จนท. สธ.)

        1.3) ทีมผู้ดูแล/อสม.

        1.4) ทีมหัวหน้าชุมชน (กำนัน/ผู้ใหญ่บ้าน)

        1.5) ตัวแทนจากชมรมผู้สูงอายุ

  2) ผู้สูงอายุ และผู้ที่จะเข้าสู่วัยสูงอายุ

แนวคำถาม Main question

Phase 1 ระยะก่อนการพัฒนารูปแบบการป้องกันการพลัดตกหกล้มในชุมชน

1) สถานการณ์การพลัดตกหกล้มของผู้สูงอายุ และการจัดการป้องกันการพลัดตกหกล้มโดยชุมชนก่อนการพัฒนา เป็นอย่างไร

        1.1) มีบุคคล กลุ่ม องค์กร หน่วยงานใดบ้างที่เกี่ยวข้องกับการป้องกันการพลัดตกหกล้มในตำบล

        1.2) บุคคล กลุ่ม องค์กร หน่วยงานเหล่านั้น มีโครงสร้าง บทบาท หน้าที่ และปฏิสัมพันธ์ต่อกันอย่างไร ในการดำเนินงานป้องกันการพลัดตกหกล้มในตำบล

        1.3) ผลที่เกิดขึ้นจากการดำเนินงานป้องกันการพลัดตกหกล้มในตำบลเป็นอย่างไร

        1.4) ปัญหาและอุปสรรคต่อการดำเนินงานป้องกันการพลัดตกหกล้มในตำบลเป็นอย่างไร

        1.5) ข้อเสนอในการพัฒนารูปแบบการป้องกันการพลัดตกหกล้มในตำบล จากการศึกษาสถานการณ์ก่อนการดำเนินงานของทีมวิจัย ควรเป็นอย่างไร

1

Phase 2 ระยะการพัฒนารูปแบบการพัฒนารูปแบบการป้องกันการพลัดตกหกล้มในชุมชน

    2) กระบวนการพัฒนา รูปแบบการป้องกันการพลัดตกหกล้มในตำบล ควรเป็นอย่างไร

        2. 1) มีบุคคล กลุ่ม องค์กร หน่วยงานใดบ้างที่สามารถดำเนินการพัฒนารูปแบบการป้องกันการพลัดตกหกล้มในตำบล

        2.2) มีบุคคล กลุ่ม องค์กร หน่วยงานเหล่านั้นดำเนินการได้อย่างไรบ้าง

        2.3) ผลที่เกิดขึ้นจากการดำเนินงานควรเป็นอย่างไร

        2. 4) ปัจจัยเงื่อนไขที่ส่งผลกระทบต่อการดำเนินงานพัฒนารูปแบบการป้องกันการพลัดตกหกล้มในตำลเป็นอย่างไร

Phase 3 การสรุปและประเมินผลการพัฒนารูปแบบการป้องกันการพลัดตกหกล้มในชุมชน

    3) การเปลี่ยนแปลงหลังการดำเนินงานของการพัฒนารูปแบบการป้องกันการพลัดตกหกล้มในตำบลเป็นอย่างไร

        3.1) การเปลี่ยนแปลงที่เกิดขึ้นต่อท่านในฐานะที่เป็นผู้เข้าร่วมโครงการในชุมชน เป็นอย่างไร

        3. 2) การเปลี่ยนแปลงที่เกิดขึ้นต่อชุมชนหลังการพัฒนารูปแบบการป้องกันภาวะพลัดตกหกล้มของผู้สูงอายุในชุมชนเป็นอย่างไร

    4) มีปัจจัยอะไรบ้าง (เช่น คน กลุ่ม องค์กร หน่วยงาน วัสดุ อุปกรณ์ วิธีการทำงาน งบประมาณ เทคโนโลยี คอมพิวเตอร์ เป็นต้น) ที่ส่งผลต่อความสำเร็จในการดำเนินงานการพัฒนารูปแบบการป้องกันภาวะพลัดตกหกล้มของผู้สูงอายุในชุมชน

    5) มีปัจจัยอะไรบ้าง (เช่น คน กลุ่ม องค์กร หน่วยงาน วัสดุ อุปกรณ์ วิธีการทำงาน งบประมาณ เทคโนโลยีคอมพิวเตอร์ เป็นต้น) ที่เป็นปัญหา/อุปสรรคต่อการดำเนินงานของ "การพัฒนารูปแบบการป้องกันภาวะพลัดตกหกล้มของผู้สูงอายุในชุมชน" และมีวิธีการจัดการกับสิ่งเหล่านั้นอย่างไร

    6) ท่านมีข้อเสนอแนะเพิ่มเติมเพื่อการดำเนินโครงการ "การพัฒนารูปแบบการป้องกันภาวะพลัดตกหกล้มของผู้สูงอายุในชุมชน" อย่างไร

การถอดบทเรียน Lesson learning

    1) สิ่งที่แสดงความสำเร็จเป็นรูปธรรม

    2) ปัจจัยสำคัญที่มีผลต่อความสำเร็จ

    3) อุปสรรคและโอกาศในการพัฒนา

| **แบบฟอร์มการถอดบทเรียนโครงการ** (Lesson learned record form) |

1. **ชื่อโครงการ**
2. **วันเดือนปีที่เริ่ม** .... **วันเดือนปีที่แล้วเสร็จ/เปิดให้บริการ** ....
3. **จุดเด่นของโครงการ (Project Highlights)** (สามารถใส่ได้หลายข้อ)

   1) ....   4) ....

   2) ....   5) ....

   3) ....   6) ....

4. **ปัจจัยความสำเร็จที่สำคัญ (Key Success Factor)** *(สามารถใส่ได้หลายข้อ)

   1) ....   4) ....

   2) ....   5) ....

   3) ....   6) ....

5. **ปัญหา Problem(ถ้ามี)** ....
6. **โอกาส พัฒนา**   Opportunity ....

....

....

ผู้รายงาน ....

เบอร์โทรศัพท์ ....

วันที่รายงาน ....

1. Actividades realizadas en el programa

Activities in the project

Activities	Pictures
Fall-risk screening. Among 350 older people in pilot community.	
Clarification of project objectives for community leaders	

To clarify the work plan to the working group	
Training to develop the potential of leaders	
Public relations campaign activities for safe environment	

Workshops for the elderly and caregivers	
Demonstration of exercise patterns at home	

Visit follow up by VHVs	

Home visits to assess and individual risk management	

Improving a safe environment	

Lesson learned in pilot community	
Dissemination of the effectiveness of the model at a conference with 20 communities in 7 southern provinces via the Zoom system	