DEVELOPMENT OF A COMMUNITY-BASED FALL PREVENTION MODEL FOR THAI OLDER ADULTS, LIVING IN AN URBAN COMMUNITY, BANGKOK

KAMONRAT KITTIPIMPANON

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Kamonrat Kittipimpanon
.....
Miss Kamonrat Kittipimpanon
Candidate

Kwanjai Amnatsatsue
.....
Asst. Prof. Kwanjai Amnatsatsue, Ph.D.
Major advisor

P. Kerdmongkol
.....
Asst. Prof. Patcharaporn Kerdmongkol, Ph.D.
Co-advisor

Suchinda Jarupat Maruo
.....
Asst. Prof. Suchinda Jarupat Maruo, Ph.D
Co-advisor

Dechavudh Nityasuddhi
.....
Assoc. Prof. Dechavudh Nityasuddhi, Ph.D.
Co-advisor

B. Mahai
.....
Prof. Banchong Mahaisavariya, M.D., Dip Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University

.....
Assoc. Prof. Witaya Yoosook, Ph.D.
Program Director
Doctor of Public Health
Faculty of Public Health
Mahidol University

Thesis
entitled

DEVELOPMENT OF A COMMUNITY-BASED FALL PREVENTION MODEL FOR THAI OLDER ADULTS, LIVING IN AN URBAN COMMUNITY, BANGKOK

was submitted to the faculty of Graduate Studies, Mahidol University
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on
November 30, 2011

Kamonrat Kittipimpanon
.....
Miss Kamonrat Kittipimpanon
Candidate

Siriphan Sasat
.....
Asst. Prof. Siriphan Sasat, Ph.D.
Chair

Kwanjai Amnatsatsue
.....
Asst. Prof. Kwanjai Amnatsatsue, Ph.D.
Member

Suchinda Jarupat Maruo
.....
Asst. Prof. Suchinda Jarupat Maruo, Ph.D.
Member

P. Kerdmongkol
.....
Asst. Prof. Patcharaporn Kerdmongkol, Ph.D.
Member

W. Pandii
.....
Assoc.Prof. Wongdyan Pandii
Dr.P.H.(Epidemiology)
Member

Dechavudh Nityasuddhi
.....
Assoc. Prof. Dechavudh Nityasuddhi, Ph.D.
Member

B. Mahaisavariya
.....
Prof. Banchong Mahaisavariya,
M.D., Dip Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University

Phitaya Ch
.....
Assoc. Prof. Phitaya Charupoonphol,
D.V.M.,M.D.
Dean
Faculty of Public Health
Mahidol University

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Kamonrat Kittipimpanon

DEVELOPMENT OF A COMMUNITY-BASED FALL PREVENTION MODEL FOR THAI OLDER ADULTS, LIVING IN AN URBAN COMMUNITY, BANGKOK

KAMONRAT KITTIPIMPANON 4937486 PHPH/D

Dr.P.H.

THESIS ADVISORY COMMITTEE: KWANJAI AMNATSATSUE, Ph.D., PATCHARAPORN KERDMONGKOL, Ph.D., SUCHINDA JARUPAT MARUO, Ph.D., DECHAVUDH NITYASUDDHI, Ph.D.

ABSTRACT

This action research was conducted to develop a community-based fall prevention model and to examine its effect on older adults, who were living in an urban community in Bangkok. Community participation and PRECEDE-PROCEED frameworkwere applied, which included: 1) situation analysis of the fall, 2) model development, 3) model implementation, and 4) modelevaluation. Both quantitative and qualitative methods were used to collect the data throughout this study.

From situation analysis, about 31.7% of older adults reported having a fall within 12 months and slipping was the most common cause of fall. Fall prevention behaviors, poor physical performance, and having pets were reported significant risk factors of fall in this community.

The process of model development consisted of 1) forming the fall prevention team and building fall partnerships, 2) building community capacity and developing a support system, and 3) empowering and sustainability. The community-based fall prevention program was a multifactorial intervention including: 1)multi-factorial risk assessment, 2) a fall campaign, 3) falleducation, 4) a balance exercise training , 5)home visits for medication reviewand for home hazard management, and 6)a fall management system.

The effectiveness of the fall prevention model was measured in terms of fall incidence, fall protection behaviors, the physical performance of older adults, community participation, and participant satisfaction. After 10 months, it was found that fall incidence was reduced by about 24.6 %, with fall prevention behaviors being improved ($t=8.255$, $p<.001$), as well as improvements in physical performance. Community and partners participated throughout the study with highest satisfaction of the model. Application of the fall prevention model for older adults requiresboth capacity building incommunity management and collaboration with stakeholders andpartners. Advanced public health nurses must play a leadership role in community health promotion.

KEY WORDS: COMMUNITY-BASEDFALL PREVENITON MODEL/ OLDER ADULT/ URBAN COMMUNITY/ACTION RESEARCH

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การพัฒนารูปแบบการป้องกันการพลัดตกหกล้มของผู้สูงอายุที่อาศัยอยู่ในเขตเมืองกรุงเทพมหานคร โดยใช้ชุมชนเป็นฐาน

DEVELOPMENT OF A COMMUNITY-BASED FALL PREVENTION MODEL FOR THAI OLDER ADULTS, LIVING IN AN URBAN COMMUNITY, BANGKOK

กมลรัตน์ กิตติพิมพานนท์ 4937486 PHPH/D

สด.

คณะกรรมการที่ปรึกษาวิทยานิพนธ์: ขวัญใจ อำนาจสัตย์ซื่อ, Ph.D., พัชราพร เกิดมงคล, Ph.D., สุจินดา จารุพัฒน์ มารุโอ, Ph.D., เดชาวุธ นิตยสุทธิ, Ph.D.

บทคัดย่อ

การวิจัยครั้งนี้เป็นการวิจัยเชิงปฏิบัติการเพื่อศึกษาผลของการพัฒนารูปแบบการป้องกันการพลัดตกหกล้มของผู้สูงอายุที่อาศัยอยู่ในเขตเมืองกรุงเทพมหานคร โดยใช้การมีส่วนร่วมของชุมชนและแบบจำลอง PRECEDE-PROCEED เป็นกรอบแนวคิด กระบวนการวิจัยแบ่งออกเป็น 4 ระยะ คือ 1) การวิเคราะห์สถานการณ์การหกล้ม 2) การพัฒนารูปแบบการป้องกันการหกล้ม 3) การดำเนินกิจกรรม และ 4) การประเมินผล มีการเก็บรวบรวมข้อมูลทั้งเชิงปริมาณและเชิงคุณภาพ และวิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา สถิติวิเคราะห์

ผลการวิเคราะห์สถานการณ์การหกล้มในชุมชนพบว่า ความชุกของการหกล้ม ร้อยละ 31.7 ผู้สูงอายุส่วนมากหกล้มจากการลื่นทั้งบริเวณภายในบ้านและภายนอกบ้าน ผู้สูงอายุส่วนมากมีปัจจัยเสี่ยงต่อการหกล้ม ได้แก่ อายุ โรคประจำตัว การใช้ยา พฤติกรรมการป้องกันการหกล้มและสมรรถาพภาพทางกายต่ำ และ การมีสิ่งแวดล้อมที่เป็นอันตราย จากการวิเคราะห์พบว่าพฤติกรรมการป้องกันการหกล้ม สมรรถภาพทางกาย และสัตว์เลี้ยงมีความสัมพันธ์กับการหกล้มของผู้สูงอายุในชุมชน

กระบวนการและกลยุทธ์ในการและพัฒนารูปแบบประกอบด้วย 1) การสร้างแกนนำและเครือข่ายของชุมชน 2) การสร้างศักยภาพของชุมชนและพัฒนาระบบในการสนับสนุนในการป้องกันการหกล้มในชุมชน และ 3) การเสริมสร้างพลังอำนาจของชุมชนและการพัฒนาความยั่งยืน โดยรูปแบบในการป้องกันการหกล้มเป็นการจัดการหลายปัจจัย ประกอบด้วย 1) การประเมินความเสี่ยงต่อการหกล้มหลายปัจจัย 2) การรณรงค์ป้องกันการหกล้มของผู้สูงอายุในชุมชน 3) การให้ความรู้ 4) การออกกำลังกายเพื่อเพิ่มความสามารถในการทรงตัว และ 5) การเยี่ยมบ้านเพื่อดูแลการใช้ยาและสิ่งแวดล้อมภายในบ้าน รวมทั้ง 6) การสร้างระบบในการป้องกันการหกล้มในชุมชน ได้แก่ ระบบการเฝ้าระวังการหกล้ม และ ระบบการจัดการสิ่งแวดล้อมในชุมชน

ผลของการเข้าร่วมโครงการเป็นเวลา 10 เดือน พบว่า อัตราการเกิดหกล้มของผู้สูงอายุในชุมชนลดลงร้อยละ 24.56 ผู้สูงอายุที่เข้าร่วมโครงการมีพฤติกรรรมในการป้องกันการหกล้มดีขึ้น ($t = 8.255$, $p < .001$) และมีสมรรถภาพทางกายดีขึ้น นอกจากนี้ชุมชนและเครือข่ายได้มีส่วนร่วมตลอดการศึกษาในครั้งนี้ โดยมีความพึงพอใจในรูปแบบที่พัฒนาในระดับสูง ข้อเสนอแนะจากการวิจัยครั้งนี้ คือ การนำรูปแบบการป้องกันการหกล้มดังกล่าวไปใช้ควรมีการเพิ่มศักยภาพของการจัดการในชุมชนและการประสานงานและร่วมมือกับผู้มีส่วนได้ส่วนเสียและเครือข่ายที่เกี่ยวข้อง โดยพยาบาลสาธารณสุขขั้นสูงควรมีบทบาทในการเป็นผู้นำในงานส่งเสริมสุขภาพชุมชน

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CHAPTER I
INTRODUCTION

Background and Rationale

Falls have become a major public health problem among older adults worldwide, with increasing prevalence and public health impact.Approximately 28-35 percent of people aged of 65 and over fall at least once a year, increasing to 32-42 percent for those over 70 years of age (World Health Organization (WHO), 2007). In addition, 15-50 % of fall victims are those with recurrent falls (Stalenhoef et al., 1997; Ministry of Public Works and Government Services Canada, 2002). The 2007 national health survey of older adults in Thailand showed that the incidence of falls among elderly Thais within the previous six months was 10.3-14.2 percent (National Statistical Office (NSO), 2007; Poomsawat, 2006). Moreover, the incidence of falls increased with advancing age, with incidences of 8.2-12.2 percent among 60-69 year olds, 10.9-17.9 percent in 70-79 year olds, and 14.7-18.7 percent in 80 year olds and above(NSO, 2007; Poomsawat, 2006).The recently reported prevalence of falls among the elderly in Thailand was 18 percent in 2009 (National Health Examination Survey Office (NHESO), 2009). The national health survey showed that older adults in Bangkok had a higher prevalence of falls, up to 2 times the rate in other regions (Poomsawat, 2006).A study of accidental falls among older adults from 9 elderly clubs in Bangkok found that 54.9 percent had experienced the fall-accidents in their community (Pasunan, Jitmontri, & Lonrithivichai, 1998). Approximately 34.3 percent of older adults in an urban poor community had one or more falls in the last six months and more than one-third of them (38.4%) suffered recurrent falls (Kittipimpanon, 2006).

Impacts of falls on older adults include physical, psychological and social problems.The national injury surveillance reported that falls were the second leading cause of severe injuries and more than 50 percent of fall victims with severe injuries

occurred in older adults (Bureau of Epidemiology, 2006). Approximately 72.3 % of fall victims had injuries as a consequence, with more than one-third requiring hospital admission (NSO, 2007). The most common serious injuries from falls are hip fractures, which typically require hospitalization. Moreover, the fall victims with hip fractures are at risk for intra-and post-operative complications such as infections, pressure sores, and decreased range of motion, resulting in loss of mobility and loss of independence (Magaziner et al.,2000).

Regarding the psychological and social impacts of falls, more than a half of Thai older adults who have fallen (66%) reported a fear of falling and one-third (33 %) of them lack confidence to perform their daily activities (Kitkumhang, Kittimanon, & Pannarunothai, 2006). Additionally, 25% of fall victims avoid essential activities and 16.7 percent report a decline in social activities outside the home (Stel, Smith, Pluijm, & Lips, 2004). Fall victims with hip fractures are reported to have increased anxiety, depression, feelings of distress, and higher suicide rates (Lausawatchaikul, 1999).

Fall victims frequently suffer decreased mobility, requiring assistance for ambulation while using devices such as walkers and canes. Forty-five percent of older adults who received hip surgery remain dependent on caregivers for at least one year after the surgery (Lausawatchaikul, 1999). The economic consequences of falls can have a significant impact on patients and their families, since hip fracture often require long expensive hospitalizations (Lausawatchaikul, 1999;Assantachai, Chatthanawaree, Thamlikitkul, Praditsuwan, & Pisalsarakij, 2002). The average length of stay for hip fracture patients is 10.8 days (Lausawatchaikul, 1999) and the average cost of hip surgery in Thailand is sixty thousand baht per person (Assantachai et al., 2002). Additionally, 32 to 80 per cent of the fall victims who survive their initial hospitalization had permanent disability (Braithwaite, Col, & Wong, 2003). Up to 50 per cent of fall victims with significant injuries die within one year of the initial injury (Robbins & Courts, 1997).

Personal and environmental factors can impact falls and its outcomes for fall victims. Most falls and subsequent injuries among older adults result from advanced age, co-morbid factors and factors related to the individual’s physical environment. Older adults with poor balance and poor vision are prone to falling,

particularly in unsafe environments like slippery floors. Individual risk factors and risk behaviorsalso increase the probability of falls when older adults encounter such hazardous environments. Several studies have reported the increased prevalence of falls with advancing age (Stevens & Sogolow, 2008). Gender has also been associated with fall risk, with female subjects having a higher risk of falls and fall related fractures than male subjects. (Stevens & Olson, 2001; Poomsawat, 2006; Shiller, Kramarow, & Dey, 2007).Similarly, older adults with health or vision problems are more likely to suffer falls and fall-related injuries (Magaziner et al.,2000; Shiller, Kramarow, & Dey, 2007). Physical performance prior to fall injuries, including balance, gait and muscle strength, is a significant factor that can affect a patient's ability to maintain balance or recover posture during a fall. Previous studies have shown that falls and fall-related injury are associated with poor balance, low gait speed, muscle weakness and low muscle mass (Chandler, Duncan, & Studenski, 1990; Pavol, Owings, Foley, & Grabiner, 2002). Similarly, difficulty with ambulation, limitations in the performance of activities daily living (ADLs) and balance problems are significant risk factors for falls among older Thai adults (Assantachai, Praditsuwan, Chatthanawaree, Pisalsarakij, & Thamliktkul, 2003; Thiamwong, 2000).

The behavioral risk factors include lack of awareness to surroundings and inability to avoid hazardous environments such as slippery floors or uneven walkways Wearing inappropriate footwear or clothing are additional fall risk behaviors(Scott et al., 2001 cited in Lookabaugh-Deur & Esdale, 2004; WHO 2007).The use of certain medications is also related with the incidents falls. Psychotropic and anti-depressant medications can significantly increase the risk of falls. Additionally, the use of four or more different medications statistically increases the risk of falling in older adults (Cumming, 1998; Leipzig, Cumming & Tinetti, 1999; Rubenstein & Josephson, 2002)

Environmental factors are the most common factors related to the risk of falling. Environmental hazards in the home can interacted with other risk factors, such as poor vision or unsteady balance, and contribute to the risk of falls and fall-related injuries (WHO, 2007).Social factors and economic status of older adults including low economic status, low education, inadequate housing, lack ofsocial interaction, limited access to health and social care, can contribute additional risk. Older adults with low socio-economic status, frequently live in unsafe homes; have poor diets, and limited

access to good health care services to manage acute and chronic illnesses. This constellation of circumstances can put them at significantly higher risk for fall injury.

Systematic reviews and meta-analyses have identified the use of multifactorial interventions as the most effective means of reducing the number of falls and fall related injuries(National Center of Injury Prevention and Control(CDC), 2008; Chang, et al.,2004; Gillespie, et al.,2006; Hill-Westmorelan, Soeken, & Spellbring, 2002; Moreland et al.,2003; Weatherall, 2004).The effectiveness of the strategies depends on the implementation of multi-component interventions including risk assessment, targeted treatments and appropriate referrals for reducing the incidence of fall(AGS, 2001; WHO, 2007). The targeted treatments include a combination of exercise, proper education, medication list review, vision assessment, and home safety assessment with appropriate home modifications (CDC, 2008). However, there is limited data on determinants of fall risk factors in Thai older adults. Furthermore the existing data does not emphasize a multifactorial or community-based approach to risk reduction, focusing instead on single interventions at the individual level. (Assantachai, et al.,2002; Pallit, 2004; Piphatvanitcha, 2006).

Although multi-factorial interventions have proven effective for fall prevention in Western communities, they have not been applied in the context of communities in Thailand. It was necessaryto understand the fall problem in the context of Thai society. Moreover, community participation provides the means to develop suitable fall prevention models in the community setting, which can lead to sustainable behavioral changes to reduce the falls and fall-related injury. Therefore, we seek to develop a community-based fall prevention model for older adults in the Thai context.

The preliminary study was conducted to understand the fall phenomena in five crowded urban communities in Bangkok, Thailand. The prevalence of falls in these communities was reported as 15.4 to 37.5 per 100 persons. The differences of fall prevalence in each community depended on characteristics of older adults in the community including age and health status. Communities with a greater number of older people and those with a higher incidence health problem have a higher prevalence of falls.The majority of fall victims were age ranged 70-79 years and were female. More than a half of fall victims had significant health problems and used multiple medications. Most falls occurred as a result of slipping inside and outside the

home.There were differences in fall patterns among the communities related to daily activities and environmental factors.Among five practicum setting under Ramathibodi hospital, Sukantaram Road community had the highest incidence of falls (37.5%) in the preliminary study. The majority of older adults were over 70 years old (54.2%).Seventy percent of older adults in this community had more than one significant health problem. Additional environmental hazards included obstructed or narrow walkway and uneven walkway thorough out the community. These factors contributed to having a higher prevalence of falls in this community. However, there was no community activity to managing fall risks.

Therefore, this study is aimed to develop a community-based fall prevention model among older adults living in an urban community in Bangkok. This model was developed based on community member, stakeholder, and network participation using the action research design. The proposed multifactorial interventions consisted of risk assessment, fall campaigns, health education, exercise activity, home visits, community environment management, and fall surveillance systems. This study provides useful information to understand the circumstances and risk factors of falling and demonstrated the effectiveness of themodel to prevent falls among older adult in the community. It will also serve as a model for fall prevention models in other urban communities in Thailand.

Research Questions

1. What were components of a community-based fall prevention model for Thai older adults living in an urban community?

2. How effective was the community-based fall prevention model for older adults, livingin an urban community?

Objectives of the study

1. To develop the community-based fall prevention model for Thai older adults, living in an urban community in Bangkok

1.1 To examine the factors related to fall of Thai older adults living in an urban community.

1.2 To examine components of a community-based fall prevention model for Thai older adults living in an urban community.

2. To examine the effectiveness of a community-based fall prevention model for Thai older adults, living in an urban community.

Hypotheses of the study

After model implementation,

1. Those Thai older adults who attended the community-based fall prevention model reported lower incidence of fall compared with before.

2. Those Thai older adults who attended the community-based fall prevention model reported better fall protective behaviors compared with before.

3. Those Thai older adults who attended the community-based fall prevention model reported better physical performance compared with before.

Scope of the Study

This study aimed to develop the community-based fall prevention model among older adults who are high risk of fall and live in an urban community in Bangkok. The model focused on modifyingthe behaviors and environmental factors that affect the risk of falls and fall-related injury.

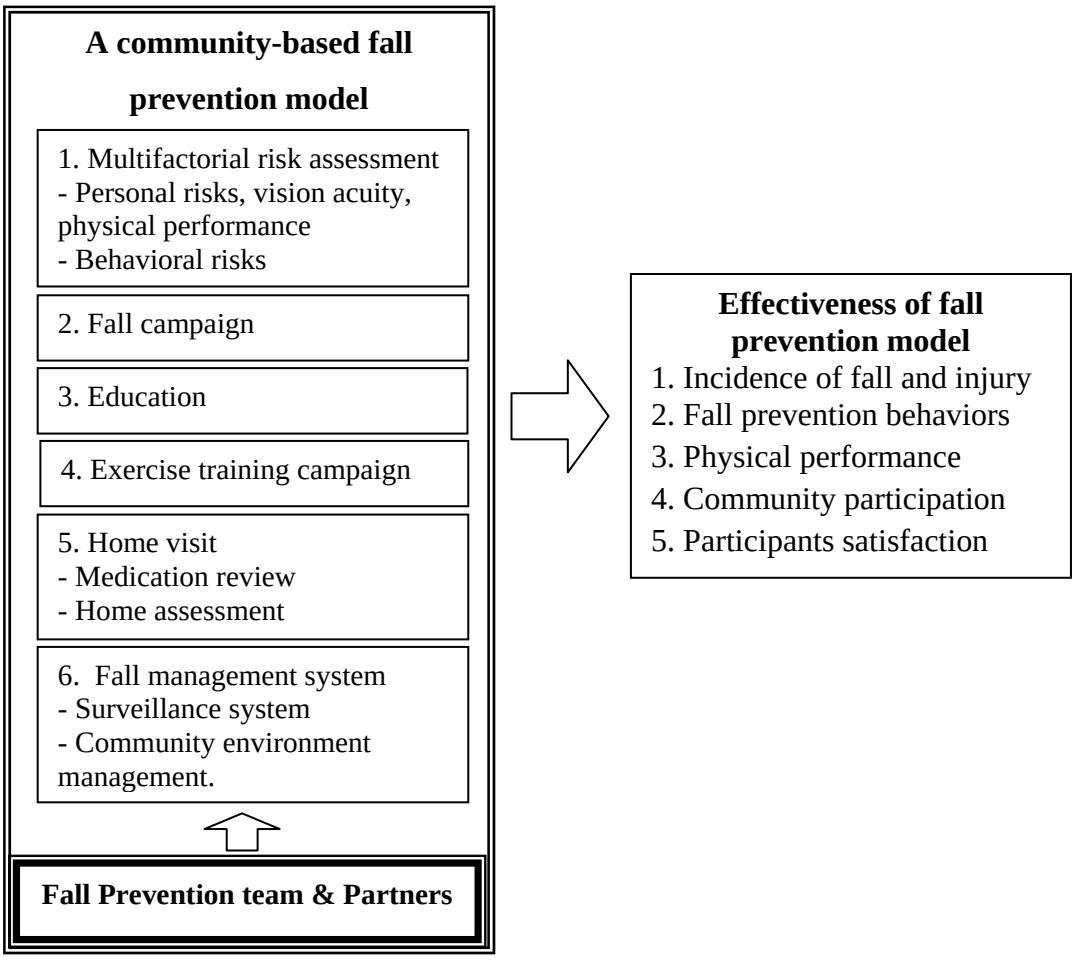

Figure 1.1 Theoretical Framework for fall prevention model of Thai older adults

Conceptual Framework

The PRECEDE-PROCEED model was used as a framework for injury prevention, to conceptualize the injury problems, develop prevention programs, and define data collection measures for the study. The full model has been applied to intervention development programs for reducing motor vehicle injuries, home injuries, child-pedestrian-related injuries, and low back injuries among postal workers (Freire & Runyan, 2006: 140).Herein, this model was adapted as a framework for developing a fall prevention model among older adults. PRECEDE was used as a guide for assessment and identification of relevant factors including behavioral, environment, and other contributing factors (predispose, reinforce, and enabling factors) among all stakeholders of the community. It was helpful to understand the fall problem and identify and prioritize the multiple related risk factors

A community-based fall prevention model was developed based on the obtained information from PRECEDE and mapping with evidences-based five components of multifactorial intervention (CDC, 2008). The components of model emphasized educational and ecological supports by involving aspects of community participation. Education was any combination of learning experiences designed to facilitate voluntary actions conducive to health (Green & Kreuter, 1999:20). It emphasizes providing the knowledge and increasing self-awareness of fall problem and fall prevention. It also provides the motivational and skill building for people in the community. Learning experience about multiple determinants of fall and systemically planned activity from learning experiences among stakeholders and community was also helpful to develop the model with the full understanding and acceptance of the program.

The ecological support for actions and conditions of living conducive to health was also a component of this framework. Because the fall problem is related to the physical and social environments, the modification of environment hazards and reorganizing the physical environment to facilitate the adoption of new behaviors was a major concern. For example, the community helped to find the fall risk area and a place to conduct exercise programs for older adults in community. Changing the social structures which influence older adults' behavior was also considered. Community team was formulated to increase self-awareness and support to minimize environment hazards. Public policy related to fall and safety, fall surveillance, annual fall screening, and environment safety management were developed as a result.

Effectiveness of the developed model included behavioral changes atthe individual level and environment modifications at community level. The expected changes at individual level include the improving fall protective behaviors and physical performance and reducing of the incidence of fall and fall-related injury among older adults in community. In addition, community participation and participation were also concerning as a outcome at community level.

Definition of Terms

1. Fall was defined as “unintentionally coming to rest on the ground, floor, or other lower level”.For this study, fall referred to the number of unintentionally coming to rest on the ground, floor, or other lower level during the last six months.

2.Fall-related injury was defined as injuries as results of fall, which classified in three categories followed as:

2.1 Serious injury referred to fall resulted in a fracture or admission to hospital with an injury or requiring stitches;

2.2 Moderate injury referred to falls resulting in bruising, sprains, cuts, abrasions, or a decrease in physical function for a period of 3 days or more.

2.3 No injury

3.The community-based fall prevention model was a multifactorial fall prevention model for community older adults as recommended by the Centers for Disease Control and Prevention (CDC) (2008). The model combined effective components to reduce fall risk factors which were designed by the community including: 1) multifactorial fall risk assessment 2) fall campaign3) education program 4) exercise program, 5) home visit, and 6) fall management system. In addition, there were fall prevention teams in the community and partners to support this model. This model was developed based on existing fall risk in the community and evidences-based of effective fall prevention intervention which was designed by the older adults and stakeholders in community.

3.1 Multifactorial fall risk assessment referred to the multifactorial fall risk assessment including personal risks (age, gender, history of fall, health status and symptoms, medication use, visual acuity, and physical performance), fall protective behaviors, and environment hazards

3.2 Fall campaign referred to activities performed to inform about the fall problem and fall prevention projects in the community including fall notification centers and fall prevention teams aiming to increase the community’s awareness for preventing fall among older adults in the community.

3.3 Education program referred to education sessions that provided tofall-risk older adults in the community. Group education with board exhibition was provided the knowledge regarding common risk factors of falls in older adults, fall

protective behaviors, medication use and side effect observation, vision screening, exercise training, and environment hazards assessment and modification. Researcher and stakeholders in the community developed and designed the education session, the researcher provided the knowledge and skill training among older adults in the community

3.4 Exercise program referred to the exercise program aiming to improve physical performance and reduce the incidence of fall including strength training and balance training exercise (Barnett, Smith, Lord, Williams, & Baumand,2003).The exercise program included group exercise and individual daily exercise which led by fall prevention team.

3.5 Home visit referred to the visiting at older adult's home aimed to medication reviews and home hazard management. The definitions were described following:

- Medication reviews referred tothe identifying the specific medication, which related with fall including sedatives/hypnotics, psychotropic drug, antihypertensive drugs, and diuretics. Older adults also were assessed the side effect of medication which related with fall including dizziness, syncope, orthostatic hypotension, and loss of balance. The recommendation was provided to older adults who had any symptoms that related with fall.

- Home hazard management referred to the assessment and management home environment hazards. Home environment hazards defined as the characteristics of inside home area including living area, restroom and stairs which leaded to danger and increase susceptibility of fall such as slippery floor, obstructed furniture, uneven floor, poorly designed stairs and restroom, and having pets. It was assessed by environment hazard checklist. The recommendation and modification home hazards were provided for older adults.

3.6 Fall management system defined as a supportive system for fall prevention activity in the community, comprising of 1) surveillance system and 2) environment management system.

Surveillance system referred to the system for monitoring fall incidence among older adults in the community by setting fall notification center in the community which responded for fall incidence and community environment

hazards. Fallers were referred to public health nurses for re-assess and risk factors and management.

Environment management system referred to community hazard assessmentand management. Community environment hazards included uneven sidewalk, damaged pathway, and insufficient lighting which were notified by fall prevention team and older adults in the community. Environment management was designed by older adults and stakeholders in the community including fall risk-area assessment the recommendation for modifying home environments hazards and supportive some materials, and creating the management system to monitor and manage their community environment hazard.

4. Effectiveness of the community-based fall prevention model was measured in terms of fall incidence and fall risk factorsbefore and after model implementation. Community participation and participants' satisfaction were also assessed after model implementation.The definitions were described following:

4.1 Fall incidence and fall-related injury measured in terms of the number of the fall events that occurred during the study period. Also fall injury and treatment were assessed in each fall events.

4.2 Fall prevention behaviors referred to the behaviors that could prevent fall among older adults, which was assessed by fall protective questionnaires.

4.3 Physical performance was the body condition that was characterized by active and healthy function with muscle strength, endurance, and agility. In this study, physical performance defined as the body condition that was proved related with fall among older adults including muscle strength, endurance, balance, and gait ability. The physical performance test included Handgrip Strength (HG), Five Times Sit to Stand (FTSS), Turn 360degree, Timed "up &go" (TUG), and Tandem Stand.

4.4 Community participation referred to the level of participation of the community, stakeholders, and partners to develop and support the fall prevention model activity.

4.5 Participants satisfaction referred to the satisfaction of older adults and fall prevention team for the community-based fall prevention model.

CHAPTER II
LITERATURE REVIEW

The aim of this study is to develop a community-basedmultifactorial fall prevention model among older adults in an urban communityforreducingthe incidence of falls and fall-related injury.In this chapter, a variety of scientific works, concepts and theories in relevant research literature were critically reviewed to provide the conceptual framework for the study. Review of literature included four following parts;

1. Situation analysis of falls in older adults
    1.1 Definition of fall
    1.2 Situation of fallsamong older adults
    1.3 Situation of falls among older adults, living in an urban community, Bangkok.
    1.4 Nature of falls in older adults
    1.5 Risk factors of fall
2. Evidence-based offall prevention programs in the community setting
    2.1 Health promotion for injury prevention
    2.2 Effectiveness of fall prevention model for older adults, living in community
    2.3 Fall prevention interventions among Thaiolder adults
3. Action research
4. PRECEDE-PROCEED Model

1. Situation analysis of falls in older adults

1.1 Definition of fall

A fall is a type of unintentional injury. The State and Territorial Injury Prevention Directors Association (STIPDA) (2005) developed a definition for falls in the all age groups as, "an event that results in a person coming to rest on the ground or other lower level precipitated by a misstep such as slip, trip, or stumble; from loss of grip and balance; from jumping; or from being pushed, bumped, or moved by another person, animal, or inanimate object or force"

Alternate definitions of falls in older age groups are available with frequent citations in the literature.The Kellogg International work group definition is the mostfrequently cited among fall studies in older adults (Hauer, Lamb, Jorstad, Todd, & Becker, 2006) and defines falls as, "unintentionally coming to the ground or some lower level and other than as consequence of sustaining a violent blow, loss of consciousness, sudden onset of paralysis as in stroke or an epileptic seizure" (Kellogg International Work Group on the Prevention of Falls by the Elderly, 1987 cited in Sattin, 1992). However, this definition is appropriate to identifying factors that impair sensory-motor function and balance control.

The Frailty and Injuries: Cooperative Studies on Intervention Techniques (FISCIT) definition is the second most frequently cited definition in fall studies (Hauer, et al., 2006). They defined falls as "unintentionally coming to rest on the ground, floor, or other lower level (Buchner et al., 1993). This definition is applied in Center for Disease Control and Prevention (CDC) studies.The Prevention of Falls Network Europe (ProFaNE) collaborators has adopted a simple definition to include falls that occur from all causes (Lord, 2007), defining a fall as "an unexpected event in which the participant come to rest on the ground floor or lower level" (Lamb, et al., 2005).World Health Organization (WHO) defined a fall as "inadvertently coming to rest on the ground floor, or other lower level, excluding intentional change in position to rest in furniture, wall or other objects" (WHO, 2007).

A literature review suggests that most studies developed their definition of fall based on the objectives of study and discipline of researchers. Thus, it is important that the definition be based on the operational requirements of the study with explicit inclusion and exclusion criteria.

Fall related injuries cause significant morbidity and are thus a major emphasis of fall prevention efforts. The definition of fall-related injury has been clarified in previous studies. One definition of fall injuries classifies them by anatomical injury location, as hip fracture injuries, skull injuries, superficial injuries etc. (Sattin, 1990). An alternate system classifies injuries by severity, as serious(a fracture, requiring hospital admission or sutures) or moderate (bruising, sprains, cuts, abrasions, seeking medical attention, or a decrease in physical function for a period of 3 days or more (Buchner et al., 1993). Some studies classify fall related injury according to radiographic fracture findings upon confirmation of a peripheral fracture (Lamb, Jorstad-Stein, Hauer, & Becker, 2005). STIPDA (2005) defines fall injuries by mechanism of injury as one, "precipitated by a fall and caused by another striking an injury-producing surface".

1.2Situation of fallsamong older adults

Falls are a significant problem among older adults worldwide. Approximately 28-35% of people aged of 65 and over fall each year. The incidence increases to 32-42% for those over 70 years of age. Approximately 40% of them experienced recurrent falls. The incidence of fall also varies by country. For instance, a study in the South-East Asia region reported a fall incidence in China of 6-31% while another reported an incidence of 20% among elder Japanese adults each year (WHO, 2007).

A review of literature on fall incidence in Thailand shows that fall related injuries are the leading cause of accidental injuries among older Thai adults. The 2007 national health survey showed that the incidence of falls among Thai older adults in the previous six months was 10.3-14.2 % (NSO, 2007; Poomsawat, 2006). Moreover, the incidence of falls increased with the increasing age at 8.2-12.2% in 60-69 years old, 10.9-17.9% in 70-79 year olds and 14.7-18.7% in those 80 years and over (NSO, 2007; Poomsawat, 2006).More recently, the prevalence of fall was reported at 18% in 2009 (NHESO, 2009). However, there was the difference in the incidence of falls reported in different communities, with Bangkok having a higher incidence of falls than other regions (NSO, 2007).

1.3 Situation of fall among older adults, living in an urban community, Bangkok

Bangkok, as the capital of Thailand, is the center of economic development and trade as well as being the industrial and commercial center. The ongoing migration of labor migrants from the countryside to Bangkok for work leads to housing problems and overcrowding. Bangkok is classified into five community types by the Department of Town and Country Planning in 2005; 1) overcrowded communities, 2) urban communities, 3) suburban communities, 4) private housing communities, and 5) national housing authority communities. The 1,809 defined communities in Bangkok include of 729 crowded communities, 357 urban communities, 348 suburban communities, 299 private housing communities, and 76 national housing authority communities. By contrast, Dusit district has 45 communities with 15 overcrowded communities 25 urban communities and 5 national housing authority communities (Strategy and Evaluation Department, Bangkok Metropolitan Administration (BMA), 2010).

The Bangkok Metropolitan Administration identifies crowded communities as communities that have at least 15 households per one rai with houses in close proximity to each other (Social Development Department, BMA, 2010). The households are typically poor and the houses are poorly designed and constructed. In addition, there are no public utilities and unsanitary conditions from poor waste product management, polluted water and polluted air. Limited land availability results in a lack of green spaces and recreational areas in these communities. Social and economic problems are predominant among people in these communities. Most of people in crowded community are migrant labor workers with low income. These problems predispose to health problems and poor quality of life among people in the community.

Previous studies showed that Bangkok had a higher incidence of falls than other regions in Thailand (NSO, 2007). A study of fall-accident in older adults from 9 senior citizen clubs in Bangkok showed that 54.9 percent of older adults had experienced fall-accidents (Pasunan et al., , 1998). In addition, a study of older adults in Bangkok found that approximately 34.3 percent had one or more falls in the previous six months and more than one-third (38.4%) suffered recurrent

falls(Kittipimpanon, 2006).A similar study reported an incidence of falls ranging from 15.4 to 37.5 in 5 communities.

The preliminary study support that there was the difference of incidence of fall and major risk factors among older adults in different communities as a result of differences in daily activities and local environment. For example, older adults of SoiPattana community often fell inside their home because they stayed at home all day (housewives), while the older adults in Pecthburi Soi 7 fell outside the home because most of them are trader or merchants, spending most of their days outdoors. The layout of the home or community environment also affected the nature of falls among adults. For instance, older adults of Wat Sukantaram community were more prone to slippage away from their homes at the nearby market where they shopped, while older adults of PecthburiSoi 7 community slipped in front their homes as a result of poor water drainage systems.The local environment thus played a role in the incidence and nature of falls and fall injuries.

1.4 Nature of falls in older adults

Understanding the nature of falls in older adults will clarify the multifactorial causes and the interaction of risk factors. A review of the literature showed that 57 % of falls occurred due to slipping, tripping, or stumbling (Schiller et al., 2007). The majority of fall-related injury occurred at home, 50% occurred inside the home while 24% occurred outside (Schiller et al., 2007).

Similarly, falls and fall related injuries among Thai older adults typically result from slipping and tripping during performance of daily activities such as walking (NSO, 2007; Poomsawat, 2006; Lausawatchaikul, 1999). Most falls occurred from slipping (42%), tripping (35%), and as a result of balance problems (34%)(NHESO, 2009). Most falls occurred during the daytimeduring routine activitiessuch as walking (Jitapunkul et al., 1998; Kitkumhang, Kittimanon, &Pannarunothai, 2006; Lausawatchaikul, 1999). Females were more likely to fall in the morning while males were more likely to fall in the evening (Kitkumhang, Kittimanon, & Pananarunoth, 2006).Older adults living in rural areas were more likely to fall outside and those in urban areas where more likely to fall indoors (Assantachai, et al., 2002; Lausawatchaikul, 1999; Pasunan et al., 1998). Most falls among elder people living in Bangkok occur in the restrooms (Poomsawat, 2006). The 2009

national health examination survey reported that female elder adults often fell indoors while male elder adults more often fell outdoors.

The incidence of, and circumstances surrounding falls are affected by multiple interacting factors. Moreover, the nature of falls different in each community and is subject to the characteristic of community and the existing risk factors. It is necessary to understand the existing risk factors and circumstances of falls in each community before designing interventions

1.5Risk factors of fall

Falls are a most common injury in older adults. The incidence of falls is related to a complex set of factors, including advancing age. Most falls and resulting injuries among older persons result from a combination of advanced age, disease-morbidity and the individual's interaction with their social and physical environment (Rubenstein, 2006). For example, the older adult who had poor balance and poor vision can slip and fall on slippery floors because of poor vision and poor balance. The risk of falling among older adults is greatly increased for those with multiple risk factors (Tinetti, Speechley, & Ginter, 1988).

Many systemic reviews have shown the most common risk factors for falls are medical conditions or intrinsic factors. Muscle weakness, prior fall history, gait and balance deficit, assistive device use, visual deficit, arthritis, impaired ability to perform ADLs, depression, cognitive impairment and age greater than 80 years have all been implicated as risk factors (AGS, 2001). The report by Lord et al. (2007) also implicated anxiety, use of medication and chronic diseases as additional risk factors. Environment factors also affect the risk of falling. Factors such as hazardous home surroundings interact with intrinsic risk factors to affect the overall risk of falls and fall related injuries (WHO, 2007). Previous studies showed that the more environment hazard is more likely to reported falling, the summary 12 studies about causes of fall showed that environment related is the most common cause of fall (Rubenstein, 2006).

Previous studies of fall risk among older Thai adults cite personal factors, behavioral factors and environmental factors as important components that interact with each other to determine the risk of falling. A national survey of falls among Thai older adults revealed that environment hazards and personal factors were the main risk factors for falls. Environment hazards include factors in the home environment

including a lack of electricity and living in the traditional Thai dwellings. Personal factors related to physical performance are also major risk factors. These include chronic diseases that limit normal activity, joint problems, problems with crouching, and poor perceived health (Jitapunkul et al., 1998). Pasunan, Jitmontri, & Ronalitiwichai (1998) study have shown that improper indoor ladder placement, poor lighting, and hazardously positioned carpeting and other household items are the major environmental risk factors for falls. The presence poor balance, mental problems, and chronic diseases worsen this risk. A study of falls in the elderly that result in hip fracture reported environmental factors as the most significant risk factors, causing 52.8% of falls. Environment factors include hazard like slippery, obstructing furniture, improper stairs, and electric device cords on the floor. Physical performance and personal factors like muscle weakness and poor balance are also important contributors to fall risk. The typical fall victim is female (80.6 %), with a chronic condition (78%) and using routine medication (69.9%) (Lausawatchaikul, 1999)

Thiamwong (2001) developed a tool to assess fall risk factors in older adults. The study reported that a prior history of fall was most significant risk factor (Odd Ratio (OR) = 107), followed by balance impairment (OR=18.23), cognitive impairment (OR=13.46), vision impairment (12.29), mobility impairment (OR=9.74), medication use (OR=9.21), female gender (OR= 4.3), traditional Thai dwellings (OR=4.19), chronic disease (OR=2.61) and advanced age (OR= 2.12). Assantachai et al. (2003) studied risk factors of fall among Thai older adults in an urban community.The report emphasized to objective clinical measures and laboratory test including mobility, self-care index, self-perceived health, visual ability, biochemical tests, and ultrasound bone density studies. Environment factors were excluded. The results showed that female gender (OR=2.5), Kyphoscoliosis (OR=2.35), and low serum albumin (OR=1.86) were important factors in fall risk. However, when considering in modifiable factors and excluding laboratory testing, the main risk factors for falls are memory impairment (OR=1.85), use of spectacles (OR=0.63), and poor performance in Instrumental Activities Daily Livings (ADLs) (OR=0.91). A separate study of fall risk factors also showed that physical performance (balance and gait impairment), female gender, and outdoor environment factors were the main risk factors (Kitkumhang, Kittimanon, & Pannarunothai, 2006).

In conclusion, the risk of falls in older adults is affected by individual factors, behavioral factors and environment factors. Results of Thai studies are similar to the results from Western countries with the exception of environment factors, which appear to be more significant in Thai populations. Environmental hazards, both indoor and outdoor, are a significant cause of falls, along with the related factor of physical performance. These factors should thus be the focus of fall prevention programs among Thai older adults.

The main risk factors are categorized into three dimensions including personal risk factors, behavioral factors, and environment factors:

1.5.1 Personalrisk factors

There are several host factors that related with fall. The natural aging process and the effects of acute and chronic health conditions increase the risk of falling and the risk of sustaining an injury from a fall. A review of the literature on personal risk factors for fall in older adults highlighted the following key points.

Advancing age is associated with an increased risk of falling. A report from the Center for Disease Control and Prevention (CDC) (2008) stated that the percentage of persons reporting falls increased with age in both sexes, from 13.4% to 14% between the 65-69 year and 70-74 year age groups. The incidence of falls continued to rise in the older age groups (Stevens, Mack, Paulozzi, & Bllesteros, 2008). A review of Thai fall studies revealed a fall incidence of 8.3-15.5 % in 60-69 year olds, 10.9-17.9% in 70-79 year olds, and 14.7-18.7 % in adults 80 years and over(Assantachai et al., 2003; Harnjangsit, 1994; Jitapunkul et al., 1999; Kitkumhang et al., 2006; Pasunanet al., 1998; Pornputasa, 1999; Tosing, Danaidusadeekul, & Chanreungwanich, 1992; Treeyawutiwat, 1991; Yompuk, 1997). The 2006 nation health survey of Thai older adults in 5 regions showed that the proportion of falls was higher in older adults with more advanced age, compared to younger age groups (Poomsawat, 2006).

Gender is also the risk factor; women reported significantly more fall-related injuries than men (Stevens et al., 2008). The fall-related hip fracture rate and hip fracture hospitalization rate in persons aged 65 years and older is significant higher for women than men (Stevens & Olsons, 2002). Similarly, local studies of Thai older adults showthe women are more likely to fall than men (Jitapunkul et al., 1998;

Kitkumhang et al., 2006; Pasunan et al., 1998; Poomsawat et al., 2006; Thiamwong, 2001). This study reported that the prevalence of falls among women (24.1%) was two times that seen in men (12.1%) (Assantachai et al., 2003). More recent studies also reported a higher prevalence of falls in women (21.9%) than men (14.4 %) (NHESO, 2009). A study of fall-related hip fracture found that 80 percent of patients with hip fracture were women (Lausawatchaikul, 1999). Similarly, a study of risk factors of hip fracture showed female gender to be a significant risk factor for with hip fractures (Wonratanarat, 2003)

Comorbidity is a risk factor for falls and fall related injuries, particularly in older adults. The diseases most commonly associated with falls in the United States are Parkinson's disease, arthritis, osteoporosis, heart disease and stroke, bowel and bladder incontinence and hypertension. Acute illnesses such as flu and other infectious diseases can cause increased frailty and physical impairment possibly leading to falls. Lamb et al., reported that 40 percent of people who suffer astroke will have a fall within the first year of the stroke (Lamb et al., 2003). Similarly, a CDC report showed that older adults with heart disease, stroke, cancer, and diabetes are more likely to experience a fall injury as a result of disease related alterations in sensory and motor functions (Schiller et al., 2007). Several studies in Thailand have suggested that older adults with at least one health problem were at higher risk of falling (Jitapunkul et al.,1998; Pasunan et al., 1998).The common diseases related to fall incidence are hypertension (Jitapunkul et al.,1998; Assantachai et al.,2003), diabetes (Hanjangsit, 1994) and arthritis or other joint problems (Jitapunkul et al., 1998). Regarding fall-related hip fracture risk factors, it has been reported that 79 per cent of older adults with fall related hip fractures have health problems such as hypertension and diabetes mellitus (Lausawatchaikul, 1999).

Visual impairment fromage-related changes is associated with an increased risk of falling. Visual impairment, typically resulting from cataracts, macular degeneration, and glaucoma, affects the ability of older adults to safely navigate their environments. Sattin (1992) reported that visual acuity and depth perception are associated with an increased risk of falling. Similarly, the CDC reported that adults with vision problems are more likely to experience a fall injury (Schiller et al., 2007). In Thailand, a few studies have reported on relationship of visual acuity

and fall risk, showing a positive relationship (Thiamwong, 2001;Hanjangsit, 1994; Treeyawutiwat, 1991). However, the national health survey has reported on visual impairment in older Thai adults (Poomsawat, 2006), with a particularly high rate of severe visual impairment in Bangkok. This impairment, which affects more than half of studied older adults, is compounded by problems with balance and gait to further increase the risk of falls (Kitttipimpanon, 2006).

Cognitive impairment is associated with an increased risk of fall injury (Nevitt, Cumming, & Hudes, 1991). Cognitive impairment associated with falls is most commonly due to Alzheimer's disease, which leads to diminished alertness and mental ability. The prevalence of Alzheimer's disease increases with age beginning at 65 and doubling about every 5 years (Salive & Guralnik, 1997). Studies of fall incidence among Thai older adults typically use screening tools, such as the Thai Mental Status Questionnaires (TMSE) and Chula Mental Test (CMT), to evaluate participants' cognitive status. While some studies have applied the test results as means to exclude potential participants with low status, one trial did report that cognitive impairment in terms of poor memory function was a risk factor of falls (Assantachai et al., 2003).

Physical Performance in older adults refers to gait ability, balance and muscle strength. Problems with physical performance may be related to age related degenerative changes, disease related organ system dysfunction or medication use**.**The incidence offalls is related to the loss of muscle strength, balance, flexibility and coordination. This can result in easy fatigability and an inability to perform ADLs and other routine activities, thus further adding to the risk. De Rekeneire et al (2003) reported that falls are associated with muscle weakness, poor balance, low gait speed, and low muscle mass. Furthermore, fall occurrence results in further decreased muscle strength (Pavol, Owings, Foley, & Grabiner, 2002). Chandler, Duncan, & Studenski (1990) reported that older adults with a history of falls have poorer subsequent balance than those no fall history. In contrast, the rate of fall declines with increasing muscle strength. Suzuki et al. (1999) reported that Japanese older adults with a history of two or more falls have lower muscle strength and slower walking speed than those without a history of falls. Similarly, Pavol et al.(2002) found that falls are associated with a decline in muscle strength including ankle extension and knee flexion.

Thai older adults with walking or gait impairment (Jitapunkul et al., 1998; Kitkumhang et al., 2006), balance impairment (Pasunan et al., 1998; Thiamwong, 2001; Kitkumhang et al., 2006), ADL limitations (Assantachai et al., 2003), and muscle weakness (Hanjangsit, 1994; Lausawatchaikul, 1999) are at high risk for falls. Several studies have applied physical performance tests to show that fall victims have lower physical performance scores (balance, muscle strength and cardiovascular endurance) than those adults without a fall history (Prachasilchail, 2000; Sanpring, 2004).

Mental Status, including depression and other psychological conditions, is associated with an increased risk of falls. This is likely associated with confusion, impaired judgment, distraction and agitation that accompany these conditions (Sattin, 1992). Studies in Thai older adults showed that mental disease is associated with an increased risk of a fall (Hanjangsit, 1994; Pasunan et al., 1998; Treeyawutiwat, 1991). Depression, in particular, has been associated with higher fall risk (Jitapunkul et al., 1998).

Fear of falling, as a result of a previous fall, is a risk factor for repeated falls. Although fear of falling can positively motivate some seniors to be more cautious and can lead to gait adaptations that increase stability, it can lead to a decline in overall quality of life through a reduction in the activities and maladaptive changes in balance control. Moreover, older adults who are fearful of falling also tend to lack confidence in their ability to prevent or manage falls, which may increase the risk of repeated falls. More than half of Thai older adults with a history of falls (66%) reported fear of falling (Kitkumhang et al., 2006).

Medications may have negative side effects like dizziness, decreased alertness, and impaired cognition affecting judgment, which can negatively affect mobility.A study of female subjects showed a significant association between psychoactive medication use and postural control (Lord et al., 1995).Antidepressant and sedative medications also contribute to the increased risk of falls and fall injury events. Significantly, certain medication combinations can result in an additional increase in risk. Previous studies showed that the use of psychotropic medication, anti-depressant significantly increase the risk of fall (Cumming, 1998; Leipzig, Cumming & Tinetti, 1999; Rubenstein & Josephson, 2002) The study indicated two- to three-

fold increased risk of falling when using psychotropic medicine, and a two-fold increased risk of experiencing a hip fracture (Lord et al.,2007).

Multiple prescription drug use is an independent predictor of fall risk and is thus an important concern. Older adults with a history of falls are more likely to have significantly more prescriptions than those without. Additionally, certain medications classes, such as antihypertensive, are more predisposing to falls than others. Additionally, using of four or more medications is statistically related to the risk of falls (Cumming, 1998; Leipzig et al., 1999; Rubenstein & Josephson, 2002).

Few studies in Thailand examine the relationship between medication use and fall incidence. Previous studies showed that multiple medication use, more than 3 classes of medication, and specific medications including sedatives/hypnotics; psychotropic drug, antihypertensive drugs, and diuretics increased the risks of fall (Kitkumhang et al., 2006; Thiamwong, 2001).

Physical activity and exercise develop strength and both the lack of exercise and excessive exercise are the risk factors for falling. Moderate and appropriate physical activity and exercise have been shown to reduce the risk of falls and fall-related injury in older adults.This is helpful by controlling weight and contributing to bone, muscle and joint strength and stability (Gardner, Robertson, & Campbell, 2000).Adults without a history of falls have significantly higher physical activity scores than those with a history of falls (Prachasilchai, 2000). Moreover, it found that the older adults who do exercise habitually have higher physical performance scores than those who do not (Kittipimpanon, 2006).

1.5.2 Behavioral risk factors

The behavioral risk factors are related to decreased attention to avoid or adapt to environmental hazards such as slippery surfaces and uneven sidewalks. Wearing inappropriate footwear or clothing are also fall risk behaviors. These behaviors that may stem from lack knowledge, impatience and carelessness can lead to falls, injuries, or even death. A review of related literature reported on the most common behavioral risk factors for falls; 1) Risk-taking behaviors**,** older adults who do not recognize their changing physical abilities and attempt to do too much can set themselves up for a fall, walking without a mobility aid when one is needed, inappropriate use of a mobility aid, or not using available aids such as hand rails or

grab bars, are all risky behaviors for older adults. 2) Inattention, older adults who are not paying attention to one's surroundings increases the chance of falling. 3) Alcohol, older adults who drink alcohol have greater risk of falling. 4) Inappropriate footwear, loose fitting shoes or slippers, shoes with slippery soles, high heels, shoes with thick soles, or frequent changing of shoe styles. 5) Inadequate diet/exercise, older adults who are poor nutritional status, an inadequate intake of protein or water, or not doing enough physical activity toward off the loss of muscle mass or loss of bone density can increase the risk of falls and injuries(Scott et al., 2001 cited in Lookabaugh-Deur&Esdale, 2004, WHO 2007).

1.5.3 Environment risk factors

Environment factors are the main risk factor of falls among older adults. It can divide into 2 major groups, 1) physical environment and 2) social environment.

1) Physical environment is a most significant risk factor affecting fall incidence.Twenty five to forty five percent of reported falls result from interaction with environmental factors (Rubeinstein&Josephonson, 2002).A review of research literature (Scott et al., 2001 cited in Lookabaugh-Deur&Esdale, 2004,) identified the following key environmental hazards as: 1) Home hazards such as throw rugs; loose carpets; electrical cords; door sills; pets; cluttered floors; poorly lit or poorly designed stairs; slippery floors; shower stalls or baths; lack of aids such as grab bars or hand rails.2) Community hazards such as uneven pavement or surfaces; sidewalk cracks; tree roots; snow or ice on walks or steps; building mats; door sills; unsafe stair design; uneven steps; poorly lit walks and stairways or sharp contrasts; slippery surfaces; poor building design; lack of handrails, grab bars, curb ramps and rest areas; obstacles such as planters, bike racks, bus shelters, garbage cans, flower boxes, pedestrian islands; or leaves that obscure changes in pavement, or become slippery when wet.

Slipping or tripping is the most common cause of falls and fall-related hip fractures (NHESO, 2009; NSO, 2007; Poomsawat, 2006; Lausawatchaikul, 1999). A study in Thai older adults showed the cause of fall-related hip fracture to be environmental factors. Slippery floors, uneven sidewalks, obstructing furniture, improper stairs and electric devices cords on the floor are the cause of tripping

(Lausawatchaikul, 1999). Falls typically result from the interaction between environmental hazards, host-related situational or behavioral factors and disease morbidity, such as poor vision or balance (Tideiksarr, 2002; WHO, 2007).

There are significant differences between environmental factors reported in the Western and Thai literature. Characteristic environmental contributions related to falls among Thai older adults include slippery floors, improper stairways, inadequate lighting and damaged or obstructed walkways (Assantachai et al., 2003; Harnjangsit, 1994; Kitkumhang et al., 2006; Pasunan et al., 1998; Pornputasa, 1999; Tosing et al, 1992; Treeyawutiwat, 1991; Yompuk, 1997). Almost all of older adults had home hazard at least one area (Pallit, 2004).

2) Social environment also increases risk of fall. Social condition and economic status of older adults include low income, low education, inadequate housing, lack of social interaction, limited access to health and social care especially. For example, older adults with socio-economic problem will encounter with poor environment in which they live, their poor diet and the fact of not being able to access health care services even when they have acute or chronic illness exacerbates the risk of falling. The difference in health and socioeconomic background that may be a difference in the most important risks factors in each country (Assantachai et al., 2002). It is reported that the prevalence of fall in an urban poor community higher than a general community (Kittipimpanon, 2006). It may occurred from poor environment in which they live, their poor diet and the fact of not being able to access health care services even when they have acute or chronic illness exacerbates the risk of falling.Moreover, the previous study showed that older adults who is single more likely than others (Pasunan et al., 1998). Moreover, the faller who lack of social support was more likely to falls than those who had social support (Panjamanas, 2005).

2. Evidence-based of fall prevention programs in the community setting

2.1 Health promotion for fall prevention

Fall prevention, as a component health promotion among older adults, is emphasized to promote healthy aging for the aging populations worldwide (CDC, 2008; Department of Health, Government of Western Australia, 2007; & WHO, 2007). The Department of Health, Government of Western Australia (2008) suggested key elements of health promotion to be applied in all settings and sectors, which overarch all health promotion intervention strategies. Aligning these with a population health approach, small improvements in all older people's health, including those at low risk of falling, can have greater overall gains than a very perceptible improvement in those at very high risk of falling. There is good justification to invest in falls prevention for well older people in the community, thus preventing a shift of the population from 'well' to 'at risk'. Similarly, investing in health promotion across each setting can reduce the shift of individuals from one setting along the continuum to the next.

The Ottawa charter for health promotion and healthy aging framework is used to develop a strategy for fall prevention. It emphasized to variety of influences or determinants that surround individuals, families and communities (WHO, 2007) including personal, behavior, physical environment, social and economic, and health and social services. Moreover, strategies to promote health following Ottawa charter including increasing personal skills; building healthy public policy; re-orienting health services; strengthening community action; building supportive environments (Department of Health, Government of Western Australia, 2008). Thus, the health promotion intervention is described as a combination of educational, organizational, economic and political actions designed with consumer participation, to enable individuals, groups and whole communities to increase control over, and to improve their health through attitudinal, behavioral, social and environmental changes (Department of Health, Government of Western Australia, 2008; & Green &Kreuter, 1999). Literature review relevant fall prevention in western country (CDC, 2008; Department of Health, Government of Western Australia, 2007; & WHO, 2007). They recommended strategies of health promotion for fall prevention followed as:

Department of Health, Government of Western Australia (2007) recommended that health promotion strategies extend across different settings. Parentheses around strategies in the lower half of the cylinders indicate the extent to which intervention strategies extend across the continuum. There are three key action areas including 1) Ensuring an effective information base to guide action in relation to falls prevention in older people, for example systematic surveillance, systematic development of the evidence base to inform policy and program design, and evaluation of intervention strategies/practices and performance management; 2) Strengthening prevention and health promotion including reduce falls risk factors and their determinants and enhance protective factors. It is well acknowledged that falls are multi-factorial and are often due to a number of predisposing factors, promote healthy ageing across the life course, build partnerships for intersectoral action and supportive public policies, and give priority to populations most at risk and ensure that policies and services developed are culturally appropriate, accessible and affordable; and 3) Strategic management of falls prevention requires a comprehensive and coordinated approach across all levels of falls prevention intervention, for example strengthen the role of prevention in the health care system, improving early detection and intervention, Integrated primary health care systems, and care partnerships and consumer participation

In addition, World Health Organization (WHO, 2007) recommended three fall prevention pillars; 1) Building awareness of the importance of falls prevention and treatment within all sectors of society that are impacted by falls and fall-related injuries for relevant people including older persons, family and caregiver, youth and young adults, community, government, health sector, and media; 2) Improving the assessment of fall risk factors for the individual, environmental, and society, that increase the likelihood of falls; and 3) Facilitating the design and implementation of culturally-appropriate, evidence-based interventions that will significantly reduce the number of falls among older person which successful multifaceted-intervention program have included such components as: medical assessment, home safety checks and advice, monitoring of prescription medications, environmental changes, tailored exercise and physical activity, training in transfer skills and gait, assessment of readiness to change behavior, and referral of clients.

The CDC (CDC, 2008) recommended implementation of effective community-based fall prevention programs to promote health and well-being among older adults. The guideline for developing fall prevention programs includes nine-step process in planning of fall prevention program; 1) Assess your community's needs; 2) Establish your program's purpose, goals, and objectives; 3) Determine what risk factors your program will address; 4) Collaborate with partners to address additional risk factors; 5)Decide who will implement the various program components; 6) Find a location to conduct the program; 7) Evaluate your program; 8) Promote your program; 9) Sustain your program.

2.2 Effectiveness of fall prevention model for older adults, living in community

Multifactorial interventionsare effective in preventing falls in the elderly people. Using many different approaches, such as education, vision assessment, exercise, medication management and environment modification, overcomes the limitations of any single intervention to solve the problem. The Cochrane Collaboration showed that multi-intervention programs for older people, both unselected and at risk older adults, are the most effective means to reduce the incidence of fall with a pool relative risk (RR) of 0.86. Muscle strengthening and balance training programs as single interventions had a pool relative risk (RR) = 0.80 (Gillespie et al., 2009).

The American Geriatric Society (AGS, 2001) recommended components of multifactorial programs to include gait training, advice on the appropriate use of assistive devices, review and modification of medications, with a special emphasis on psychotropic medication, balance training programs, treatment of postural hypotension, modification of environmental hazards and treatment of cardiovascular disorders.

The World Health Organization (WHO, 2007) recommended multifactorial interventionsas highly effective in reducing falls among older adults. They recommend the programs to include predication and training, providing balance and gait training with appropriate use of assistive devices, medication review and

management, managing visual problem, and environment risk assessment and modification and addressing foot and shoe problems and orthostatic hypotension

The CDC Center of Injury Prevention and Control (CDC, 2008) also recommended components of an effective community-based intervention, consisting of risk assessment and targeted treatment and referral. The targeted treatments involve specific exercises (gait and balance training), combined with other fall risk reduction measures such as education, medication review, vision assessment, and home safety assessment and modifications, as needed (CDC, 2008).

Table 2.1The suggestion of the component of multifactorial intervention

Studies / Component of multifactorial	AGS 2001	WHO 2007	CDC 2008
Education	✓	✓	✓
Vision assessment and management	✓	✓	✓
Medication review and management	✓	✓	✓
Specific exercise (balance and gait training)	✓	✓	✓
Home safety assessment and modifications	✓	✓	✓
Advice on the appropriate use of assistive devices	✓	✓	
Treatment of orthostatic hypotension	✓	✓	
Foot and Shoe problems assessment		✓	
Treatment of cardiovascular disorders	✓	✓	

The components of multifactorial intervention

The effectiveness of the components in multifactorial interventions are described as follows.

1) Education

Education, as an individual intervention, can ineffectively reduce fall rates andthe risk of falls (Reinsch, MacRae, Lachenbruch, & Tobis, 1992; van Haastregtet al., 2000). As a component of a multifactorial intervention, education has been shown

to be most effective for preventing falls (CDC, 2008). The components of a multi education program provide the means of knowledge management by proving 1) understanding of the risk factors, 2) improvement in balance and strength by specific exercises, 3) coping with visual loss and regular visual screening 4) medication management, and 5) environmental and behavioral home safety (Clemson et al., 2004). Group education sessions are recommended as an effective method for sharing knowledge (CDC, 2008). Group sessions provided the benefit of social interaction and sharing experience. The goal setting and problem solving were included in the group session process.

2) Vision assessment and management

The vision assessment and management is important to prevent falls due to vision loss. Effective interventions include vision assessment and management. The visual acuity assessment tools identify at-risk individuals in the community. The education programs advise older adults to undergo regular visual screening and care as a preventive measure. The interventions to manage visual impairment include teaching coping with visual loss, wearing appropriate eyeglasses and care, and refer to comprehensive vision exams and treatment.

3) Medication review and management

The purpose of medication review and management is to identify and eliminate medication side effects and interactions. Medications that are commonly associated with falls are psychoactive medications including antidepressant, tranquilizers, antipsychotic, antianxiety drugs, and sleep medication. Moreover, the older adults who take four or more medications are at additional higher risk of falling. Medication reviews should be completed by healthcare providers, with support and advice from consulting physicians, to reduce the number or doses of medications.

4) Exercise

Exercise is the only intervention that by itself reduces falls among older adults (CDC, 2008). However, appropriate and specific exercises are recommended for fall prevention that improves strength, balance and coordination. These can include traditional exercises like Tai Chi. There were two major types of exercise that were proved effectively reduction falls among older adults 1) Combination of specific

exercises include strengthening and balance training, and/ or endurance training, gait training, and aerobic activity. 2) Tai Chi exercise.

4.1) Combination of specific exercises includes strengthening and balance training, and/ or endurance training, gait training, and aerobic activity.

Exercise programs that are specifically designed to improve strengthen and balance are effective to reduce falls in older adults (Barnett et al., 2003; Campbell et al., 1997; Lord et al., 2003; Rubenstein et al., 2000). Previous trials have designed exercise interventions that combinedifferent types of exercises. For instance, Barnett et al. (2003) designed a group-based exercise program including functional exercise, balance and coordination, strengthening, and aerobic activity. They reported a reduction in the rate of falls in the intervention group by 40% compared to the control group. Campbell et al. (1997) designed a home-based exercise program that included strength and balance training with interval in-home visits and monthly telephone support and motivation. They reported a 35% reduction in fall rates as a result of their intervention. Lord et al. (2003) developed a conditioning program consisting of aerobic exercises, specific strengthening exercises, and activities for balance, hand-eye and foot-eye coordination, and flexibility, the result showed that 22 percent all participants and 31 percent the participants with history of fall in intervention groups less likely to fall than control group. Rubenstein et al. (2000) used a group-based exercise program consisting of strengthening, endurance training, and balance training which reduced fall rates among participants at 3 months.

Key elements of typical exercise programs are describes as follows.

Functional Training: sit to stand practice, weight transference and reaching (Barnett et al., 2003).

Balance and coordination training: modified Tai Chi exercises, stepping practice, change of direction, dance steps and catching/throwing a ball (Barnett et al., 2003). The activities for balance included tandem foot standing, heel-toe walking, line walking, standing on one leg, altering the base of support, weight transfers (from one leg to the other), rocking back and forth onto toes and heels, rotating on the spot, lateral movement challenges, and reaching and stretching movements away from the center of gravity (forward, laterally, and upward). The flexibility exercises were undertaken in the seated and standing positions. They included toe pointing forward

and laterally and heel strike exercises moving the heel forward and to the sides (Lord et al., 2003). Balance training used a rocking balance board, balance beam, obstacle course, and group activities such as balloon volleyball and horseshoes. Balance training sessions were held twice a week and increased in difficulty over the 12-week program. (Rubenstein et al., 2000).

Strengthening training: using the participant's body weight for sit to stand exercises and wall press-ups, using resistance bands, for both the upper and lower limbs (Barnett et al., 2003). Ankle cuff weights (0.5 kg and 1 kg) for the following muscle groups: hip extensor and abductor muscles, knee flexor and extensor muscles, inner range quadriceps, and ankle plantar and dorsiflexor muscles (Campbell et al. 1997). Specific graded muscle group strengthening exercises were undertaken with an increased number of repetitions per session. Muscle groups targeted included ankle dorsiflexors, knee extensors, hip abductors, and hip side-flexors. Repetitions were increased from four at Week 2 to 30 at Week 10. Thirty repetitions were then maintained for the remainder of the program (Lord et al., 2003). Strength training included hip flexion, extension, abduction, and adduction; knee flexion and extension; squats, dorsiflexion, and plantar flexion. Over the first 4 weeks, participants increased each exercise from one to three sets of 12 repetitions. Resistance levels also were increased progressively. The rate of progression was modified for subjects with physical limitations (Rubenstein et al., 2000).

Aerobic activity: fast walking practice including change of pace and direction (Barnett et al., 2003). Movement of the legs, trunk, and arms to involve all joints and major muscle groups, the leg movements were designed to use the full range of movement of the hip, knee, and ankle joints and to condition and strengthen all major muscle groups, the trunk movements were designed to maintain flexibility of the spine and to condition and strengthen the back, chest, and abdominal muscle groups. The arm movements were designed to use the full range of movement of the shoulder, elbow, and wrist joints and to strengthen all major muscle groups, wholebody exercises included pacing, dance patterns, directional changes and speeds, and complicated routines of wholebody movement (Lord et al., 2003).

Endurance training included sessions that alternated cycling (once a week), treadmill (twice a week), and indoor walking, either walking laps or flights of

stairs (twice a week). Heart rates were monitored to ensure that participants did not exceed 70 percent of their heart rate reserve. (Rubenstein et al., 2000).

Walking pattern exercises consisted of large strides, heel-toe walking, narrow- and wide-based walking, and sidestepping (Lord et al., 2003).

The frequency and duration of effective program: Most of effective programs were moderate intensity exercise, the class ran one hours, once a week (Barnett et al., 2003; Lord et al., 2003), twice weekly, (Lord et al., 2003) for 1 year period (Barnett et al., 2003; Lord et al., 2003), 1 ½ hours, three a week for 3 months (Rubenstein et al., 2000). Most classes consisted of three sections: a 5- to 15-minute warm-up period, a 35- to 40-minute conditioning period, and a 10- minute cool-down period (Barnett et al., 2003; Lord et al., 2003). In home-based exercise, the exercise took about 30 minutes, three times a week and to walk outside the home at least 2 times a week for 1 year (Campbell, 1997)

4.2) Tai Chi Exercise

Tai Chi is a traditional exercise that had been shown to be an effective intervention for fall reduction (Li et al., 2005; Wolf et al., 2003). The basic Tai Chi exercise emphasizes the individual movements linked together to flow smoothly from one form to another. The movements of Tai Chi, when performed with continuity, involve characteristics such as body and trunk rotation, flexion/extension of the hips and knees, weight shifting, postural alignment, coordinated arm movements, and postural control (Swaim, 1999 cited in Li et al., 2008).

There are five main schools of tai chi, namely Chen, Yang, Sun, Wu (JianQian), and Wu (He Qin) (Wolf, Coogler, & Xu, 1997). They differ in the characteristics of the practice level of difficulty. An early study showing the effectiveness of Tai Chi to reduce falls was reported by Wolf, Barnhart, et al. (2003).They conducted 15-weeks of Tai chi exercise class that synthesized the existing 108 forms Tai Chi into 10 components and showed a 47.5% reduction in fall rate in participants. Tai Chi Yang exercise also showed significant to reduce falls, a 1-hour class, three times per week for 6 months of this Tai Chi style showed that the intervention group had significant fewer falls and injurious falls than the control group and their risk of falling was decreased fifty-five percent(Li et al., 2005).

Recently, Wolf et al. (2003) adapted 8-form Tai Chi program (Easy Tai Chi) designed for older adults that derived from a traditional 24-form Yang-style Tai Chi. Although no evidences support the effect for fall reduction, preliminary data support the potential of Easy Tai Chi for achieving health outcomes improvements (self-reported SF-12, mental and physical scores, instrumental activities of daily (IADLs), and the physical performance living similar to those derived from more complex Tai Chi forms. (Li et al., 2003).It also showed feasible and evidenced good class attendance, high participant satisfaction, and interest in continuing Tai Chi (Li et al., 2008).

5) Environment modification

Home hazard assessment and modification are important component to prevent fall among older adults. However, no clear evidences support the effective of home assessment and home modification intervention independently to reduce the number of falls. Only a study showed the effectiveness of community-based home safety and home modification, using the pre-post test of self-report falls, 60 % reduction of reporting falls after intervention (Plautz, Beck, & Selmar, 1996). Most interventions can reduce falls only the people at risk such as having history of fall, frail older people and visual impairment. The previous study showed that there was the difference of the number of fall between interventions and control group only the older adults who had history of fall, and the intervention was delivered by occupational therapist with home visit for suggestion and modification (Cumming et al., 1999; Salkeld et al., 2000). The study among frail older people in Home Intervention Team (HIT) project showed significant to prevent fall by the intervention group had 31% fewer falls than control (incidence rate ratio (IRR) = .69) Nikolaus & Bach, 2003). Home visit and hazard modifications that provided by occupational therapy among older adults with visual impairment was effective in preventing fall, the intervention group had 60% fewer falls than control (incidence rate ratio (IRR) = .40) (Grow, Robertson, Campbell, Clarke, & Kerse, 2006).

Moreover, the previous study showed that only the education could not reduce the environment hazard. However the identified home hazard modification needed some people or some organization to support those modifications such as older adults' families or government, for example only 2 cases of participants that can

modify their environment after they got the suggestions because their families support for changing those environment (Pallit, 2004). Most studies had the funding to support home modification or free installation safety devices (Plautz et al., 1996; Salkeld et al., 2000; Stevens, Holeman, & Bennett, 2001).

2.3 Fall prevention interventions among Thai older adults

Most existing interventions in Thailand (Jitapunkulet al., 1998; Assantachai et al., 2002; Pallit, 2004; Piphatvanicha, 2006) (Table2.2) emphasized on minimizing single risk factor. It is also rarely to address environment modification. It describes follow as:

Jitapunkul et al (1998) developed the regular surveillance by using a simple questionnaire administered by non-professional personnel every 3 month and creating the referral system for older adults who are high risk of falling (fall more than 2 times in the last 3 month). The older adults who are high risk of falling will referred to Physician and Nurse for appropriate management. However, there was no statistically significant difference in fall rate in 18 month between two groups. Later, Assantachai et al (2002) used the post-card followed up every 2 month and giving health information about fall prevention one time. The incidence of falls was significantly reduced in the study group. However, this study did not assess the risk of fall and management the risk of fall of older adults in this study. Both of these studies suggested primary prevention among health older adults in the community.

Pallit (2004) emphasized to assess the multifactorial assessment including personal factors and home environment. The intervention provided the education, changing practice, and suggestion for home modification. However, the results showed that this program can effect to improve only the perception of fall and fall prevention however, it could not change their environment hazard. Only 2 cases can modify their environment because their family helped them changing their environment. This study provided the useful information that only the suggestion could not change environment hazard.

Piphatvanicha (2006) developed fall prevention program. Two components were included in this program 1) Four sessions in health education and 2) 8-weeks for Tai Chi exercise program. The results showed that the experimental groups had

statistically significance better scores of physical performance (Berg Balance and Timed up & go Test) than control groups. However, this intervention did not concern about environment factors.

Literature reviews of existing intervention showed that previous studies emphasized to reduce the single risk factors at the individual level. Moreover, it rarely to concern about environment factors that showed the major risk in Thai older adults and major components of effective intervention. The intervention that includes environment factors should be concerned to develop effective intervention. Moreover, the changing of environment is needed social support, which the previous study showed that only 2 cases can modify their home environment hazard because their families support to change that environment (Pallit, 2004). In addition, previous studies and preliminary study showed that not only home environment but also community environment that are the important factors of fall in Thai situation. Therefore, family and community are needed to involve for developing fall prevention model among older adults in an urban community.

Table 2.2 The component of intervention in previous Thai studies

Component of intervention	Jitapunkul et al (1998)	Assantachai et al (2002)	Pallit (2004)	Piphatvanicha (2006)
Sample	Age ≥ 70	Age ≥ 60	Age 60-74	Age ≥ 60 & History of fall (12 month)
Fall assessment	✓		✓	✓
Postcard followed		✓		
Education		✓	✓	✓
Practice posture			✓	
Tai Chi exercise				✓
Referral	✓			

3. Action research

Action research is a systemic approach to investigation that enables people to find effective solutions to problem they confront in their everyday lives. It focuses on specific situations and localized solutions (Stringer, 2007:1). Action research requires a particular practice setting to identify and describe problems needed to be changed. The researcher needs to concede possible solutions to the problems take action to implement those solutions in the problem setting, carefully evaluate the process and the outcomes of the certain changes and the desired effect.

Action research is a collaborative approach to inquiry or investigation that provides people with the means to take systematic action to resolve specific problems. The basic action research routine provide the simple yet powerful framework –look, think, act that enables people to commence their inquiry in a straightforward manner and build greater detail into procedures as the complexity of issues increases.

Community-based action research

Community-based action research is a collaborative approach to inquiry or investigation that provides people with the means to take systematic action to resolve specific problems.This approach to research favors consensual and participatory procedures that enable people

1) To investigate systematically their problems and issues,

2) To formulate powerful sophisticated accounts of their situations, and

3) To devise plans to deal with the problem at hand

Community-based action research focuses on the methods and techniques of inquiry that take into account people's history, culture, interaction practices, and emotional lives.The elaborate routines of traditional scientific research, which from the perspective of the practitioner, were often shrouded in the mists of technical language and mystified by complex statically procedures community-based action research accessible to both professionals and laypersons.Community-based action research provided a means for people to "get a hand" on their situations and formulate effective solutions to problems they face in their public and professional lives.

The basic community-based action research routine started with the simple framework of community-based action research and built greater detail into procedures as the complexity of activities increases.The look, think, and act were

elements of a continually cycle of activities as participants work through each stage.They explore the details of their activities though a constant process of observation, reflection, and action. At the completion of each set of activities, they reviewed (look again), reflected (reanalyze), and re-acted (modify their actions) based on information from each stage of research process. As experiences shows, action research was not a neat, orderly activity that allowed participants to proceed step by step to the end of the process. People found themselves working backward through the routines, repeating process, revising procedures, rethinking interpretation, leapfrogging steps or stages, and sometimes making radial changes in direction.

1) Look

The objective of this process was for the researcher to assist stakeholders in describing the situation clearly and comprehensively. The researcher helped stakeholders in defining the problem in their own terms and describing their community contexts in detail.

This exploration revealed the taken-for-granted visions and versions of current situation that make up people's day- to -day life worlds, with their unquestioned assumptions, views, and beliefs, out in the open and displaying inspection. As people struggle with the collective vision/version of their world, new possibilities for resolving their problems and discovered. This activity was liberating, enabling people to master their world as they see it in a different way. The tasks of research facilitators in the look stage were building the picture and developing descriptive accounts.

1.1) Building the picture

The researcher facilitators enabled stakeholder groups to formulate jointly constructed descriptive accounts of the situation at hand. Each stakeholder groups defined a descriptive account of its context separately, and then worked with other groups to draft a joint descriptive account.

1.2) Developing descriptive accounts

As researcher facilitators gather information, they did so based on conditions and circumstances emerging from their interactions with the groups. The focus of their information gathering activities would be formulated according to their problems, issues, and concerned if the various stakeholder groups. In the initial stages

of projects, researchers met informally with variety of stakeholder groups to discuss general issue and to formulate a general picture if the context. As issues emerge, formal meeting provided contexts for developing detailed descriptive accounts.

2) Think

In this phase, the stakeholders constructed explanations to extend their understanding of situation analysis and developed joint constructions to interpret and explain the problem under investigation.

The main task of the researcher was to interpret and render understandable the problematic experiences being considered. Interpretation built on description through frameworks to enable participants to make better insight of their experiences. It utilized experience-near concepts drawn from people's day-to-day lives to clarify and untangle meanings and to help the individuals illuminate and organize their experiences. The researchers provided the opportunity for participants to understand their own experiences.

Interpretive activity exposed the conceptual structures and pragmatic working theories that people used to explain their conduct. The researcher's task was to assist participants in revealing those taken-for-granted meaning and reforming them into "constructions improves, matured, expanded, and elaborated" and that enhance their conscious experiencing of the world. It was not intended as merely intellectualized, rational explanations; rather, it was real-life constructs-in-use that assist people in reshaping their lives.

Diverse perspectives exist in any situation, ensured that members of each stakeholder groups comprehend the interpretations of other groups with whim they were working, Biographies, stakeholders, experiences and perspectives, and relationships within and between each of the stakeholder groups are focused.

Therefore, this phase was the process of systemic inquiry that extended stakeholders' understanding of the problems, affecting their work and community lives. The routines embodied principles of practice that enabled researchers to develop positive working relationships with community members by communicating effectively and providing opportunities for stakeholders to participate meaningfully in research activities.

3) Act

The acting phase involved three steps as follow: 1) Planning which involves setting priorities and defining tasks, 2) Implementing the supporting, modeling, and linking activities that help participants to accomplish their tasks, and 3) Evaluating, in which participants review their progress.

3.1) Planning, setting priorities and defining tasks

Researcher facilitators anticipated meeting with all stakeholders to obtain consensus on the actions to be taken. This crucial point was likely to have a big impact on the success of the project. If stakeholders agreed on a course of action and become engaged in activities, they were likely to invest considerable time and energy in research activities.

3.2) Implementing the supporting, modeling, and linking activities that help participants to accomplish their tasks

Community-based processes started with a flourish. Much enthusiasm and energy were generated and people set off to perform their designated tasks. The best of intentions often ran up against the cold, hard realities of daily life. Participants reentered family, work, and community context, where ongoing responsibilities and crises crowd out new activities. As participants attempted to implement the tasks, research facilitators should provide the emotional and organization support to keep them on track and to maintain their energy, model sound community-based processes, and link the participants to a supportive network.

3.3) Evaluating, in which participants review their progress

Evaluating processes formulated joint stakeholder descriptions and interpretations. Evaluation was carried out a joint construction of stakeholder groups.

- Place their claims, concerns and issues, and the table for consideration.

- Review information obtained from interviews, observation, documents, and group constructions.

- Resolve claims, issues, and concerns.

- Prioritize unresolved items.

Several action researches supported the benefits that all of the stakeholders gained. Action research was also one of the important strategy, which suggested by the PRECEDE-PROCEED model. It was important for changing the individual and

stakeholder behaviors in each phase. The members or the informants had participated in designing and implementing activities, learning the new skills, providing in the new social actions, and achieving the conscious and empowerment.

4. PRECEDE-PROCEED Model

The PRECEDE-PROCEED Model is a framework for health promotion planning based on health promotion framework has been developed by Green & Kreuter (1999) in the 1970's. The strategy of health promotion in this framework is any combination of educational and ecological supports for actions and conditions of living conducive to health. These actions may be the personal behavior and lifestyle adaptations of individual and families, the advocacy of organizational or public policies to assure healthful living conditions, or direct intervention by individuals or groups to improve environmental living conditions

The PRECEDE-PROCEED Model provides step-by-step approach to assist providers in creating appropriate health promotion projects. It works in tandem, providing a continuous series of phases in planning, implementation, and evaluation. The identification of priorities in the one phase of PRECEDE lead to quantitative objectives that become goals and targets in the implementation phase of PROCEED. Also, they are standards of acceptability or criteria of success in the evaluation phases of PROCEED. Throughout the work with PRECEDE and PROCEED, two fundamental propositions are emphasized 1) Health and health risks, caused by multiple factors and 2) because health and health risks are determined by multiple factors, efforts to effect behavioral, environmental, and social change must be multidimensional or multi-sectorial.

The PRECEDE- PROCEED planning framework provides practitioners with a comprehensive, systemic model for analyzing health promotion problems, and designing interventions, behavioral and environment factors predispose, reinforce, and enable health-promoting behavior.

The eight phases of the PRECEDE- PROCEED

Six basic phases comprise the procedure. Evaluations of impact and outcome can be extended to seventh or eighth phase, depending on the evaluation requirements. The phases are described in the following brief summary (Figure 2.1)

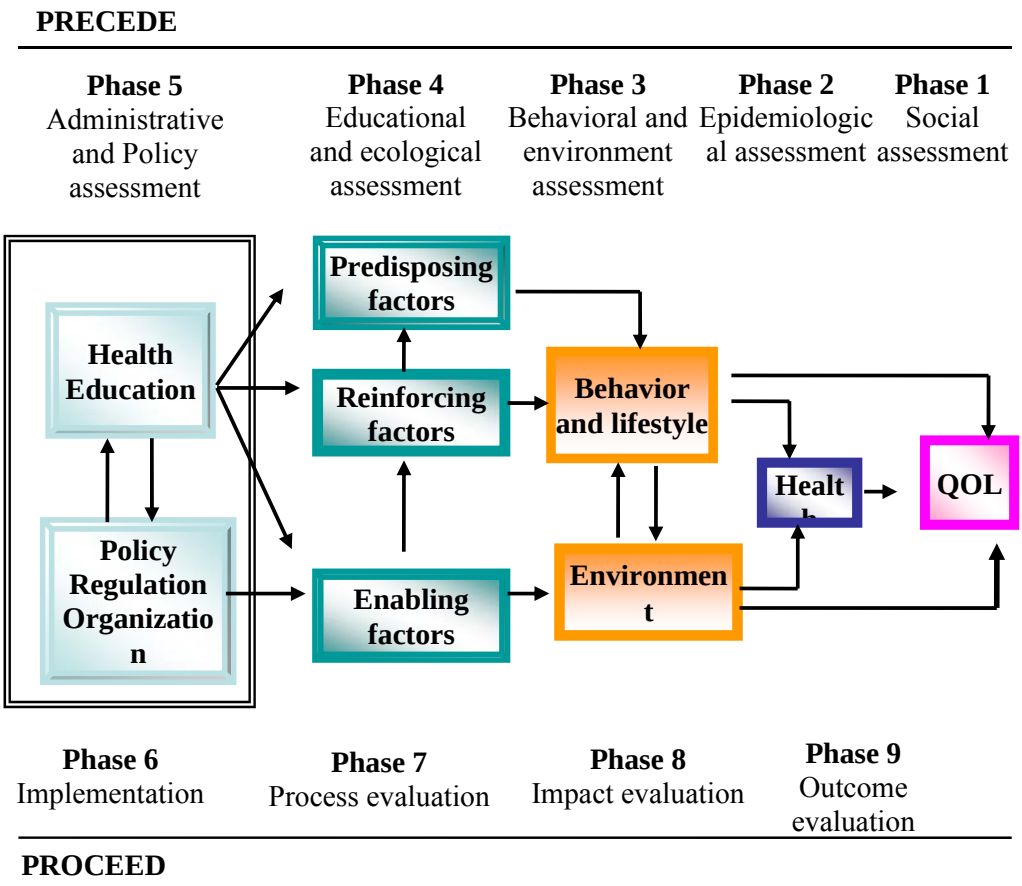

Figure 2.1 The PRECEDE- PROCEED Model for health promotion

Phase 1: Social assessment and Situation analysis

This is the process of determining the community's perceptions of their needs or quality of life, their inspirations for the common good. This is best accomplished by involving the people in a self-study of their own needs and aspirations. This assessment is achieved through broad participation and application of multiple sources of information designed to expand understanding of the community.

Phase 2: Epidemiological assessment

The tasks of phase 2 are to identify the specific health goals or problems that may contribute to social needs or problems noted in phase1. Using available data, generated by appropriate investigations and epidemiological findings, the researcher ranks the several health problems or needs.

Phase3: Behavioral and environmental assessment

Behavioral and environmental assessment consisted of identifying the specific health related behavioral and environmental factors for any selected health problems with the most deserving of attention in Phase 2. The process of setting priorities on the basis of causal importance, prevalence, and changeability is important at each factors selected in one phase to require dozens of causal factors to be considered in the next.

Environmental factors were the external determinants that are modified to support behavior, health, or quality of life, being cognizant of such forces will enable planners to be more realistic about the limitations of programs consisting of health education directed at personal health behavior of the public

Phase 4: Educational and ecological assessment

The educational and ecological assessment identifies factors that require change to initiate and sustain the process of behavioral and environmental change. The determinants of health and social condition identified in this phase will become the immediate targets or objectives of a program (Green & Kreuter, 1999: 153). Three general categories of factors affecting individual or collective are predisposing factors, reinforcing factors, and enabling factors

Predisposing factors are antecedents to behavior that provide the rationale or motivation for the behavior including a person or population's knowledge, attitudes, beliefs, value, and perceptions that facilitate motivation of change.

Reinforcing factors are factors following a behavior that provide the continuing reward or incentive for the persistence or repetition of the behavior. Reinforcing factors may encourage or discourage continuation of behavior. Reinforcing behavior produces lifestyle change; influence the environment through political advocacy, consumer demand, or cumulative actions.

Enabling factors are antecedents to behavior that allow a motivation to be realized. It includes all conditions that make a possibly desired change in behavior or in the environment. They may be skills, resources, or barrier that can help or hinder the desired behavioral changes as well as environmental changes. These skills can be viewed as vehicles or barriers to those antecedents of behavior motivation include the

availability, accessibility, and affordability of health-care and community resources, which facilitate the performance of an action.

Phase 5: Administrative and policy assessment

This phase involves the assessment of organizational and administrative capabilities and resources, policies, abilities, and time. This phase also identify the specific settings in which health promotion activities must take place. The implementing organization may itself provide a setting for implementing the population focus of the program. The setting dictates the specific methods, material, and other intervention components.

Phase 6, Implementation

This phase identified the diagnosis steps, the area to be targeted, and the methods to mobilize the 7 program; implementation of the health promotion activity is next. A few remaining areas to investigate are budget, policy, regulation and organizational resources. A timetable is established to create time frame in which objectives and organization issues are to be carried out.

PRECEDE-PROCEED assume that planners who have followed the systemic process laid out in the first five steps will have rich information to develop intervention and evaluation strategies (Freire&Runyan, 2006:139-140). Different interventions are required for changing the predisposing, reinforcing, and enabling factors, which is why it is important to identify these risk factors before committing to a particular intervention strategy or methods.

Phase 7, 8, and 9: Evaluation (Process, Impact, and Outcome)

Evaluation is an integral and continuous process form the beginning through all phases of implementation. The criteria for evaluation fall naturally from the objectives defined in the corresponding steps in PRECEDE during the assessment process. Process evaluation (Phase7) starts from the first time a team meets to create a health promotion activity. Phase 8 and 9 Impact and outcome evaluation are developed on the objects of the project.

PRECEDE-PROCEED model has been used as a framework for injury prevention, to conceptualize injury problems, develop prevention programs, and define data collection measure. The full model has been applied to intervention development can be found for program to reduce motor vehicle injuries, home injuries, child-

pedestrian-related injuries, and low back injuries among postal workers (Freire & Runyan, 2006: 140).

Recommendation of most important point when using PRECEDE-PROCEED approached for developing intervention from an evidences-based perspective (Freire & Runyan, 2006: 140) included: First, planners match broad intervention components to their prioritized ecological level. Second, planners map tested best practices to their selected intervention components. Finally, planners pool information on promising practices and input from the intended audience to fill in program activity gaps.

Therefore, this model is useful framework for developing fall prevention intervention and evaluation interventions among older adults. It is helpful to understand the fall problem as well as identify and prioritize multiple risk factors including behavioral factors and environment factors, and their related factors and conditions in the studied community. The obtained information from Precede is need to mapping with the best practices from evidences-based five components of multifactorial intervention. Then, the community and stakeholders collaborate to design intervention strategies filling the gap in that community. The obtained intervention in this study should be suitable for preventing fall among older adults in an urban community, which lead to sustain behavior changes and reduce the fall and fall-related injury as the long-term outcome.

CHAPTER III
MATERIALS AND METHODS

This chapter presents the research design and methods organized for the development of a fall prevention model among Thai older adults in an urban community as followed.

1. Research Design
2. Research Setting
3. Population and Sampling
4. Research procedures and Research instruments
5. Protection of Human Subjects
6. Data Analysis

1. Research Design

Action research was proposed to be used to develop a fall prevention model. It aimed to increase the closeness between the actual problems in a specific setting.A community participation that involve stakeholder in activities ranging from defining needs for fall prevention to pre-designed prevention model was needed to develop the effective intervention. Prevention policies and activities that were to be implemented were those supported by research evidence, and communities were asked to customize and prioritize their initiatives depending on local concerns and interests.

Therefore, action research was conducted to develop the community-based fall prevention model for Thai older adults, living in an urban community. Effectiveness of a community-based fall prevention model was assessed in terms of fall incidence among Thai older adults in a community. This study consisted of 1) Pre-research phase and 2) Research phase.

2. Research Setting

This study was conducted at Sukantaram Road community, one of 15 urban crowded communities in Dusit District, Bangkok (Strategy and evaluation department, 2010). The Sukantaram Road community was selected as a study community for several reasons, including: 1) having the highest incidence of falls of the five communities 2) having strong community leadership, 3) having human capital and necessary resources for model development including public health nurses, public health volunteers, elderly clubsand 4) strong networks of fall prevention model development.

Figure 3.1 Geographical area of Sukantaram Road community

Figure 3.1 showed the location of Sukantaram Road community, which covers an area of approximately 9 rai, with a population of 1,900 people in 400 households (Social development department, 2010). The community was under the management of the Crown Property Bureau. Most of older adults lived in a wood houses and a small rent room. The community is used for housing, with the remaining areas, particularly along sidewalks. It was used for food vender, groceries, garages, and car parkmaking obstruct and narrow available walkways. Furthermore, many

walkways have been damaged by large tree roots and deterioration of the pavement resulting in widespread unevenness of walkways in the community.

From the previous community survey (Sixth Public Health Center, 2009), reported 573 individuals in 263 households were permanent community residents and were available for the survey. One hundred and two people were older adults (17.8%), with40 males and 62 females. Most of them were widowed, divorced or separated and lived with child and grandchild. Approximately 72 % of older adults had at least one chronic condition, of which hypertension (50.0%), diabetes mellitus (23.0%), and hyperlipidemia (16.6%) were the most common. Thirteen percent of older adults reported more than 2 fallswithin 3 months.

The preliminary study in 2009 showed that the Sukantaram Road community reported the highest fall prevalence of the five communities (37.5% over six months) under the in the practicum settings of the Faculty of Medicine Ramathibodi Hospital., has a higher prevalence than the national average fall rate (18 %) (Poomsawat, 2006). Slipping was a common cause of falls in this community. Older adults in the Sukantaram Road community suffered from falls indoors (55.6%) and outdoors (44.4%). The sitting room was a common area for fall occurrence inside the home while the market was a common area of fall outside the home. Most falls occurred in the daytime while performing routine activities. The common environment risks for falls were the uneven floors and obstructed walkways inside the home and slippery floors in the market. Regarding fall-related injury, the report showed that one-third of fall victims (33%) suffered fractures requiring an Emergency Room visit. However, there was no system to address the fall problem among older adults in this community.

3. Population and Sampling

3.1 Population

Study population was categorized into three groups according to each research phase, including 1) older adults, 2) community leaders, and 3) stakeholders. A total number of 102 older adults lived in the selected community during data collection. Most of older adults (60 %) were local persons who lived in Sukantaram

Road community for more than 10 years, while some had migrated from the North-East Thailand, 16 community leaders and stakeholders.

3.2 Sample

Purposive sampling was applied to recruit participants at the different phase

1) Pre-research Phase

A public health nurse(PHN), a community leader, an elderly club president, an older adult, and two public health volunteers (PHVs) were interviewed about fall situation and community contextwith fall and available resources including stakeholders.

2) Research Phase:

The participants consisted of two groups as followed:

Group 1: Older adults who lived in Sukantaram Road community. Forty-one older adults met the inclusion criteria and admired to participate in the model. A Total of twenty-eight older adults who participated in the model at least 80 % of activities were included in the study.

Inclusion Criteria

1. Older adults who were 60 years old or above.
2. They were able to verbally communicate in Thai.
3. They lived in Sukantaram Road community at least 6 months.
4. They were willing to participate with signed inform consent.

Exclusion Criteria

1. They had been screened for cognitive dysfunction as determined by a score of less than 15 on the Chula Mental Test.
2. They were dependent as regards the performance activities of daily livings as determined by scores of Barthel ADL less than 12.
3. They had exacerbation of their disease or acute illness that affected their ability to participate in this study.
4. They were not willing or able to complete the study or participated in the less than 60 percent of the program.

Group 2: Stakeholders were the gatekeepers who deal with the impacts of fall problems and had the influence to develop a fall prevention model in their

community. A total of eighteen stakeholders included community leader, public health volunteers (PHVs), elderly club representatives, public health nurse, and older adultswho met the criteria were invited to participate as the research team in this research. In addition, representatives of the Crown Property Bureau and Dusit district office were invited to participate as partner organizations in this study.

Inclusion Criteria

1. They were able to verbally communicate in Thai.
2. They were willing to participate with signed inform consent.

Exclusion Criteria

1. They had problem of perception, hearing problem, visual problem, or mental health problem.

4. Research procedures and Research instruments

Research procedures and research instruments were presented following the research phase (Figure 3.2). Research instruments were categorized into three groups as screening instruments, intervention instruments, and data collection instruments. Research procedures and research instruments were described as followed:

4.1 Pre-research phase

This phase familiarized the researcher with the community. This phase emphasized understanding the community context, building relationships with people in the community, identifying and preparing stakeholders for working in the research phase, and raising community awareness. The research procedures and the research instrument in this phase are described as follows.

Research procedure

The activities in the pre-research phase consisting of 1) understanding community context, 2) building the relationship with the community, 3) identify and preparing stakeholders, and 4) raising community's awarenesswere described as followed:

1) Understanding community context

Interviewing key informants and reviewing previous reports from a public health nurse, a community leader, an Elderly club president, and two public health

volunteers were conducted to collect the data. This activity provided a context for the researcher to understand the community relative to the fall problem.

1.1 The researcher obtained an introduction letter and permission to proceed from the Faculty of Public Health, Mahidol University and Bangkok Metropolitan Associations (BMA).

1.2 The researcher contacted the public health nurse (PHN) who was a home visiting nurse for the Sukantaram Road community at 6th public health center. The proposal and ethics permission were presented to PHN. Public health nurse provided some basic information about the community. The researcher shared data on the fall problem among older adults in the community. This discussion yielded the community profile report which was reviewed by the researcher. Following this, the researcher and the PHN approached the key community individuals. The older club president was reached by telephone appointment.

1.3 Five key persons were interviewed individually at home during separate session lasting45-60 minutes. These included a community leader, an elderly club president, an older adult and two public health volunteers. The researcher made mp3 recordings of the interviews and took field note with participants' permission. In addition, the researcher also asked for the community reports such as community profile, community committee structure, health service structure, community health report, health examination report etc.the reviewing the secondary data was conducted to understand community context.

1.4 The public health nurse identified the two key persons who needed to be approached before planning to work with older adults in the community including an elderly club president and a public health volunteer (PHV). The elderly club president and PHV are responsible the older adult population as gatekeepers for most services making them essential facilitators during the project. Elderly club president could inform older adults in the community on participating in this study because older adults in this community respect and trust him and his long experience as a community leader, since 1990. He has been president of the elderly club since its establishment in 2007. The elderly club provides much the benefit for its members. For example, they contacted with 6th public health center for providing health examination every year in the annual meeting of elderly club. The elderly club

president is also responsible to find financial support from non-government organization or personal donations of time and resources. Thus, elderly club president is a gatekeeper who can facilitate access to the community.

The public health volunteer (PHV) was selected by the PHN from the five PHVs the in Sukantaram Road community, because of her prior experience with older adults in the community. She was also the secretary of elderly club in this community and the wife of the elderly club president. The PHV was trusted and respected by the older adult population, particularly regarding health concerns.

1.5 Three more key informants who could give more information regarding community context were identified by the PHV, including 1) community leader who could provide the history of community, the structure and function of the community, the past and present community activities, and community networks in the community; 2) PHV leader who could provide information in role and function of PHV and the connection with public health nurse; and 3) an older adult could provide specific information regarding the lifestyle and community networks of older adults living in the community. The community leader and the PHV provided existing reports of previous community activities.

2) Building the relationship with the community

2.1 The researcher sought to develop individual relationships with the three key persons, namely the PHN, the elderly club president, and the PHV. The researcher first presented the preliminary data on the fall problem among older adults in their community and encouraged knowledge sharing based on their experience with fall problem among older adults in the community. In addition, researcher expressed willing to help the community to solve the problem and explained the objectives and process of this research. This researcher emphasized community participation throughout the study as a means to addressing the fall problem. The collaborators expressed interest in and a desire to support the project. The personal interviews also provided an opportunity to build trust and familiarity between the researcher and key persons in the community.

2.2 A group discussion including the researcher, the PHN, the elderly club president, and PHV, was conducted to discuss the fall problem in the community and to develop a mutual fall prevention model. The key persons suggested an“International

Day of Older Persons" (October 1st), as an appropriate day for opening the project and increasing self-awareness of fall problem among older adults in this community.

2.3 The researcher joined activities conducted by community leaders and community networks such as 1) joining the meeting of quality of life development project that was provided by the Crown Property Bureau; 2) joining with 6th public health center for some activities such as health screening, health followed up (Blood sugar checked) among diabetes mellitus (DM) patient in the community, and public health volunteers meeting; and 3) annually meeting of elderly club. These activities served as a way to build relationship with people in the community and an opportunity to introduce the researcher, built relationships and connections with network (partners) in the community. It was also an opportunity to learn more about the relationship between community and networks.

3) Identify and preparing stakeholders

After initial relationship building with community leaders and stakeholders, the researcher identified additional individuals to be included in the research project. There were five persons who were identified as an initial research team including a PHN, a community leader, an elderly club president, and two public health volunteers. "International Day of Older Persons" on October, 1stwas suggested by research team for informing the research project and raising community's awareness of fall problem among older adults in the community

4) Raising community's awareness

The Elderly club activity event on October 1st (International Day of Older Persons) was an opportunity for raising the community's awareness of the fall problem among older adults in the community. The research team used this event to present the fall problem data from the preliminary study and this fall project description. A basic fall prevention handbook was distributed to older adults in attendance.

A public relations campaign for this project was conducted by the research team including community broadcast, posters and personal solicitations (invitation letters), aimed at increasing community awareness. This helped to recruit additional people to assist with the fall prevention project.

Research instrument

Community assessment guideline: This guideline was used to collect data regarding the community context by interviewing key informants and reviewing secondary data from the community. The topics included the history of the community,a community profile (geographical environment & household structure, population structure & health status, economic status (occupation & income), education & culture, politics and government, lifestyle, etc.), community resources (place, program, budget, club, foundation), health services structure in the community, social support systems, the nature of the fall problem in community, and community awareness of the fall problem (Appendix A).

4.2 Research phase

Research phase consisted of four steps including 1) situation analysis, 2) model development, 3) implementation, and 4) evaluation.The research instruments and the research procedures were described following:

4.2.1 Situation analysis

During this phase the research team gathered information on the fall problem in their community. The information in this step was useful to understand the fall problem and to develop fall prevention model for the community.

Research procedures

The activities in this step were described as followed:

1. The meeting of the 4 initial project leaders was conducted to organize the fall risk assessment event including equipment preparation, venue selection, and assistant selection.The assistants were trained to give information, make assessments and collecting the data during the event.

2. The research team coordinated with local partners for the project, such as the 6th health canter. PHV contacted other PHVs, and the elderly club president contacted the Sukantaram temple as a possible venue for the event. Community broadcast system was used, by community leaders, to announce the event publically. The researcher trained the research assistants to assist with the physical performance tests.

3. An invitation letter was distributed to older adults in the community. PHVs visited at older adult's home for distributing the invitation letter.

4. Fall risk assessment was conducted by the research team and partners at Sukantaram temple. The assessments where made available for interested older adults and those willing to participate in the project. Fall risk assessment was done by both questionnaires and physical testing, separated into 8 stations including 1) demographic data & history of fall, 2) behavior risk and environment risk assessment, 3) visual acuity test, 4) handgrip strength test, 5) tandem stand test, 6) Five Times Sit to Stand (FTSS), 7) Turn 360 degree, and 6) Timed "up &go" Test. Each individual assessment lasted 30-40 minutes per person. Data was collected from each station assessment for later evaluation.

5. The obtained data from assessment was identified fall phenomena, faller group, people at risk and fall risks among older adults in the community.

6. The research team made appointmentswith two groups of people for separate focus group discussions including 1) Ten of thirteen older adults who had experiences fall and 2) Eight stakeholders who had experience with fall victims (three Community leaders and two PHVs which all of them were an elderly club committee, Elderly club president, and PHN). The procedures in this step are described as:

1) Participants were informed about objectives, procedures, activities and human right protection and are asked for voluntary participation.

2) The researchers scheduled the time and place for the focus group discussion and reminders where issued one day before the scheduled meetings.

3) Eight to ten participants were included in a focus group. A focus group also included one researcher as the moderator and one research assistant as a note taker and participant observation. The focus group was conducted to discuss about the fall risk of older adults in their community, fall risk factors of community and the strategies for fall prevention. The focus group guideline (Instrument 5) was used to facilitate participants open discussion, sharing experiences about their fall experiences in the community and strategies for prevention fall in their community.

4) Participants were completed written informed consent before beginning focus group discussion.The focus group took place around their community

and range from 60-90 minutes to talk and discussion. The researcher use mp3 recorder and field note taking with participant permission.

5) Field note taking was used to obtained data of the focus group discussion. The detailed of events observed were taken down in record book.The date, time, place, activities, participants, events, problems, and solutions were recorded by researcher or research assistant. Participant observation was performed during focus group discussion. Observations included the participants' behaviors, the process, the response, facial expression, voice and their interaction.

Research instruments

This step consisted of two screening instruments and six data collection instruments. The detail and validation of instruments were described as follows.

Screening instrument consisted of 2 instruments including Chula Mental Test (CMT), and Barthel ADL (ADLs)(Appendix B).

1. Chula Mental Test

Chula Mental Test (CMT) was used to measure the cognitive function and dementia symptoms in older adults (Jitapunkul, Kamolratanakul, & Ebrahim, 1994). A 13-item questionnaire with 2 scores, 0 = incorrectly answers and 1= correctly answers. Total score ranged from 0-19, the higher score the better function. The Chula Mental Test has been widely used for cognitive function screening of older adults, living in a community. The sensitivity and specificity for detecting dementia were 100% and 90%, respectively (Jitapunkul, Lailert, Worakul, & Srikiatkhachornm, 1996). Using the cut-off point of 15, the sensitivity andspecificity for dementia screening were 83.3% and 91.7%, respectively (Jitapunkul, Worakul, & Kiatprakoth, 2000). Participants who had scored lower than 15 and having cognitive impairment were excluded from this study.

2. Barthel ADL

Barthel ADL was developed by Mahoney & Barthel since 1965. It was used to measure the dependency in Activities Daily Livings of older adults in this study.It assessed the ability to do ten activities including 1) feeding, 2) grooming, 3) walking, 4) toilet use, 5) transfer, 6) dressing, 7) stairs, 8) bathing, 9) bowels control, 10) bladder control. Each item was not equal score depending on the importance for living. The total scores ranged from 0 to 20 (A score of 0-4 = total dependence; 5-8 =

severe dependence; 9-11 = moderate dependence; 12–19 = mild dependence; 20 = independence). Reliability of Barthel ADLs was suggested for basic geriatric assessment of older adults with the high reliability 0.89 (Meyer, Nemitz, Harms, Saint-Mont, & Krauth, 2000).Participants who had scored lower than 12 and having dependency were excluded from this study.

Data collection instruments consisted of six instruments including 1) demographic data and history of fall, 2) the Thai Fall Risk assessment Test (Thai-FRAT), 3) fall prevention behavior questionnaire, 4) environment hazard assessment, and 5) physical performance test, 6) focus group guideline (Appendix B). There was examining the content validity by 4 experts (Appendix F), and the reliability which were described each component following:

1. The researcher collected demographic data. The questionnaire included demographic data obtained from the interview. The demographic data consisted of age, gender, marital status, education, occupation, and income, health problem, medication use, related symptoms, and history of fall

2. The Thai Falls Risk assessment Test (Thai-FRAT) was used to measure the fall risk factors among older adults and identify the older adults at high risk of fall in the community (Thiamwong et al, 2001). It is composed of six factors including history of falls, impaired body balance, female gender, specific medication use, impaired visual acuity, and Thai Style house. The totaled score ranged from 0-11 points, with a higher score indicating a higher risk of falling. Using cut-off point of 4 points, the sensitivity and specificity for high risk of fall were 0.92 % and 0.83%, respectively (Thiamwong, Thamarpirat, Maneesriwongul, & Jitapunkul, 2008).

3. Fall prevention behaviors questionnaire was developed by the researcher based on the literature reviews. It was used to measure the prevention behaviors among older adults in the community. It was a 20-items questionnaire with 4 possible responses for each question; 1= regularly, 2=often, 3=sometimes, and 4=don’t practice. The questionnaires consisted of 5 partsincluding fall prevention behaviors 9 items (1-9), vision care items (10), medication use 2 items (11,12), exercise 2 items (13, 14), and environment 8 items (15-22). A higher score correlated with better prevention behavior. The content validity showed content validity index by

4 experts was .85. The Chronbach's Alpha reliability showed reliability of this questionnaire was 0.64.

4. Physical environment hazard assessment was constructed from literature reviews and preliminary data. The hazard environments included both home hazard environment and community hazard environment. The checklist was used to assess the existing environment hazards consisted of 24 items with 4 important areas including inside home area (1-8), restroom (9-13), step (14-16), and community (17-22). The content validity showed content validity index by 4 experts was 1.00.

5. Physical Performance was assessed in term of four dimensions including of muscle strength, endurance, balance, and gait ability. The physical performance was related with fall (de Rekeneire et al., 2003), and recurrence of fall (Stel, Smit, Pluijm, & lip, 2003). Each physical performance test was described following:

5.1) Handgrip Strength was used to measure the muscle strength by using handgrip dynamometer. The handgrip strength was reported as being related with fall. It was evident that there were relationships between handgrip strength and elbow flexion strength (r = 0.67), knee extension strength (r = 0.51), and trunk extension strength (r = 0.54) (Rantanen et al., 2003). The handgrip strength test was commonly used for assessing muscle strength because it was simple in terms of measuring procedure. It was reported that handgrip strength was related with fall (Chu, Chi, & Chiu, 2005). Prior to data collection, the research assistant was trained regarding positioning and methods of measure with the handgrip dynamometer. Each participant was asked to sit down on the chair and hold the dynamometer in hand, with the arm at right angles and the elbow by the side of the body. The handle of the dynamometer is adjusted if required - the base should rest on first metacarpal (heel of palm), while the handle should rest on middle of four fingers. When ready the participants squeeze the dynamometer with maximum isometric effort, which is maintained for about 5 seconds. The participants were strongly encouraged to give maximum effortand repeatthe steps again (Topendsports, 2010). The maximal handgrip strength was determined and reported in kilograms. The higher value represented higher muscle strength. Using the cutoff point by Rantanen et al (2003), older adults who had handgrip strength test less than 18 kilograms (low muscle

strength) was identified as a high risk of fall person.The test-retest reliability in this study was 0.91

5.2) Five Times Sit to Stand (FTSS) was used to measurethe lower body strength. It is reportedly related to fall risk (Csuka & MaCarty, 1985 cited in Tiedemann et al, 2008; Guralnik et al, 1994) and is a component of fall risk assessment (Berg, Wood-Dauphinee, Williams, & Maki, 1992). In addition, Five Times Sit to Stand (FTSS) was reported as the best test for predicting falls in older adults in the community because of its acceptably validity and reliability (ICC=0.89) (Tidemann, Shimada, Sherrington, Murray, & Lord, 2008). Each participant was asked to sit to full stand with arms folded across chest, five times, as fast as possible. The stopwatch was started when the individual stood up from a seated position and then stopped when the elderly returned to the starting position. The longer time period indicated the lower strength. Using the cutoff point for FTSS by Tidemann et al. (2008), older adults who spent time to complete FTSS more than 15 seconds were identified as a high risk of fall person. The test-retest reliability in this study was 0. 78.

5.3) Turn 360 degree was used to assess dynamic balance. It often used to assess the risk of falling among older adults. The previous study showed thatthe older adults who took more than 3.8 seconds to complete this test were at a higher risk of falls with excellent reliability (ICC=0.90) (Dite & Temple, 2002). Each participant was asked to turn 360 degrees. The stopwatch was started when the researcher said “go” until the participant finished turning around. Using the cut-off point for Turn 360 degree by Dite & Temple, 2002, older adults who spent time to complete Turn 360 degree more than 3.8 seconds were identified as a high risk of fall person.The test-retest reliability in this study was 0.73.

5.4) Timed “Up &Go” (TUG) was used to assess balance and gait ability. It was developed for measuring the physical performance in terms of functional ability including balance, gait ability, and activities of daily livings (ADLs) (Mathias, Nayak, & Richardson, 1986 cited in Shumway-cook, Brauer & Woollacott, 1998). It was reported as an instrument for predicting falls among older adults in community with reliability was 0.98 (Shumway-cook et al., 1998). Moreover, in describing physical mobility in community-dwelling elderly people, the reliability was 0.97 (Steffen, Hacker &Mollinger, 2002). The equipment required for this test included a chair,

measuring tape, stopwatch, and a cone. The participants were instructed to sit with their backs against the chair, then stand upright and walk at normal pace for a distance of three meters to the line on the floor, turn around the cone, return to the chair and sit down. The stopwatch was started when the individual stood up from a seated position and stopped when they returned to the starting position. This test measured the overall time in seconds to complete. Using the cut-off point for Timed “Up & Go at 12 seconds by Bischoff et al (2003), older adults who spent time to complete TUG more than 12 seconds was identified as a high risk of fall person.The longer time they used, the poorer balance and gait ability they had.The test-retest reliability in this study was 0.90.

6. Focus groups guideline: fall risk factors and fall prevention was used to collect qualitative data regarding fall risk factors and fall prevention strategies. The focus group guideline was developed by the researcher and used to explore fall risk factors and fall prevention strategies among older adult with a fall experience and stakeholder group members. The guideline included details of fall problem in the community and determinants based on the PRECEDE-PROCEEDframework including personal factors, behavioral factors, and environment factors. It also discussed other contributing factors (predisposing factors, enabling factors, and reinforcing factors) and fall prevention strategies from their experiences. The content validity was examined by 4 experts with the high content validity index (CVI =1.00).

Focus group involved six to eight people who met once for one and a half to two hours. This format can be used for a wide range of population groups and research objectives. Data were generated by interaction between group participants. Participants presented their own views and experience, and shared the insights from others in the group. They listen, reflect on what is said, and in the light of this consider their own standpoint further. Participants asked questions of each other, seek clarification, comment on what they have heard and prompt others to reveal more.

Field note taking was used to obtained data of the focus group discussion. The detailed of events observed were taken down in record book. The date, time, place, activities, participants, events, problems, and solutions are recorded by researcher or research assistant.

Participant observation was performed during focus group discussion as the observer, the researcher presented their role as the observer and participates only activities that related with their research. Observations included the participants' behaviors, the process, the response, facial expression, voice and their interaction.

4.2.2 Model Development

This step was conducted with A-I-C techniques for development fall prevention model among older adults in community by reflecting preliminary finding, analyzing and identify the fall problem in the community and the community's needs for developing the fall prevention model in the community.

Research Procedures

After obtaining data from situation analysis, the researchers made appointment with representatives of two groups (three older adults in faller group and 6 stakeholders (PHN, two PHVs, elderly club president, two community leaders)

The procedures in this step were described as:

1. The group discussion with A-I-C Techniques took place within their community and lasted 60-90 minutes. The researcher used mp3 recorder and field note taking with participants' permission.

2. The researcher presented the results of risk assessment, focus group discussion among fall victims and stakeholders. An open discussion was facilitated about the results of these assessments and options to solve the problems. The possible fall prevention model in their community was designed based on the existing data and evidence-based fall prevention model (CDC, 2008). Then, we collaborated setting the goal, designed the activities to solve the problem, identified the people to help us as a leader team of the project in the community, and partners to help ongoing the project.

3. After setting goals and the elements of the fall prevention model, the priority actions were performed. Seven persons were selected as the team leaders, to be assigned to the five zones and were designated zone leaders.The zone leaders were responsible for taking care older adults in their zone, disseminating the news from fall prevention project to older adults in their zone. The facilitated home visit withpublic health nurses to assess medication use and their side effect and home environment suggestions. The date and time of each element were planned in advance.

4. The research team identified the social network that could support activities of fall prevention among older adults in the community. Such community partners included the 6thpublic health center, the Crown Property Bureau, and the Dusit district office.

5. The field note taking was used to obtain and record data from the group discussions including detailed notes of observations from the event. The date, time, place, activities, participants, events, problems, and solutions were recorded by the researcher or research assistant. Participant observation was performed during focus group discussion. Observations included the participants' behaviors, the process, the response, facial expression, voice and their interaction.

Research Instrument

A-I-C discussion guideline (Appendix C) was used to develop the fall prevention model in the community. It was developed by the researcher and consisted of six activities including 1) Reality (A_1), 2) Ideal vision (A_2), 3) Solution Design (I_1), 4) Prioritization (I_2), 5) Action Plan (C_1) and 6) Responsibility (C_2). 4 experts examined it for content validity. The content validity index (CVI) of this instrument was 1.00.

4.2.3 Implementation

The obtained fall prevention model was implemented by research team. Research procedures and research instruments were described, respectively.

Research procedures

After getting the action plan, the research team implemented the program following the action plan. The elements of fall prevention model were described following the priorities action.

1. Multifactorial fall risk assessment was the first activity of model and was measured in the situation analysis. It aimed to identify the risk factors among older adults in the community and the high risk people in the community. The multifactorial risk assessment assessed 1) the demographic data and history of fall, 2) the Thai Fall Risk assessment Test (Thai-FRAT), 3) fall prevention behavior questionnaire, 4) environment hazard assessment, and 5) physical performance test.

2. Fall Prevention campaign was the second activity aiming to increase self-awareness among older adults and overall community awareness. The activities in fall campaign are described as follows:

2.1 Research team met for campaign activity planning and creating a logo and slogan stickers for fall prevention program. We also designed warning sign stickers (slip and trip caution) to distribute to older adults in the community.

2.2 The fall prevention campaign and community broadcasts were aimed as informing the public on the fall problem and fall prevention among people in the community, especially older adults and their families. We also introduced the fall prevention center, which functioned for control and management fall problem in the community. Slogan and warning sticker were given to older adults and their family. The invitation letter for attending education session was also distributed at that time.

3. Fall education program was aimed at increasing knowledge and self-awareness which should lead to prevention behaviors improvements. The activities in education program are described as follows:

3.1 The researcher trained fall prevention team leaders on fall risk factors and fall prevention strategies. In addition, the leaders invited two fall victims to share theirexperiences.

3.2 Collaborative development ofthe handbook describing fall risk factors and fall prevention for older adults.

3.3 Planning activities and identifying responsible persons, and coordinating with Sukantaram temple as a meeting venue.

3.5 Conducting education sessions on 4 activities including 1) sharing experiences from fall victims and older adults and prevention strategies discussion, 2) fall prevention exhibition, 3) zone leaders introduction 4) group discussion of activities among older adults and zone leaders including exercise groups and home visits.

3.6 Inviting the Dusit district office and the Crown Property Bureau participating to this event as partnersin the fall prevention model.

4. Exercise group activity aimed at promoting exercise for strength and balance training to improve physical performance. The activities in exercise group are described as follows.

4.1 Identifying and preparing a venue and equipment including chairs and a CD-player for the exercise group.

4.2 Developing the handbook for individual home exercise and the poster for the group exercises as a guide for participants.

4.3 Training fall prevention team to be exercise leaders.

4.4 Educating and Training in the strength and balance exercises including specific directions on the exercises and fall awareness in the exercise activity.

4.5 Monitoring and evaluating the exercise activity including the attendance rate, and the problem of exercise activity. Potential problems included the date and time of exercise group, low attendance rate, unstable chairs, and inappropriate shoes for exercise.

4.6 Modifying the exercise activity based on the identified problem list including: 1) Setting the regular date and time for exercise group and monitoring home exercise with a daily recordand 2) visiting older adults' homes to recruit the older adults who did not attend exercise group, and 3) collaborating with partners to provide more stable chairs and appropriate shoes for older adult.

5. Home visit was the next activity aimed at assessing home environment hazards and reviewing medication use among older adults in the community by the public health nurse and the fall prevention team. The activities of the home visit were described following:

5.1 Public health nurse and fall prevention team visit at older adults in their homes.

5.2 Reviewing the medication use and side effects related to falling including dizziness, vertigo, fatigue, and weaknessfor older adults who reported medication use.

5.3 Assessing the home environment hazards and recommending home environment modification for older adults and their families to modify their hazard.

5.4 Summarizing the home hazard environments in the community and planning to support home modification as possible for those home hazards.

5.5 Followed up home environment hazard in the next home visit.

6. Fall management system was developed to support fall prevention activities using 2 separate systems described as follows.

6.1 The surveillance system was used to monitor the fall incidence among older adults in the community. The development of the surveillance system included:

1) Creating a fall notification center to notifying fall incidents and environment hazards in the community.

2) Developing the surveillance record formfor recording the fall incidents and identifying the fall risks. It was used to plan fall prevention activities for fall victims and other older adults in the community.

3) Developing guidelines to evaluate falls by the PHN, who will then visit the subject and reassess fall risk factors.

6.2 The environment hazard management was used to assess and manage the environment hazard in the home environment and community environment. The activities included:

1) Setting up the environment team for assessment and management environmental hazard in the home and community.

2) Coordinating with partners responsible for the community environment, such as the Dusit district office.

2) Conducting community hazard environmental assessment by fall prevention team and reporting to the responsible Dusit district office.

3) Establishing contact with other public places frequented by older adults including the Sukantaram temple and Rachawat market. Building relationship and informing responsible parties about fall risks and prevention to increase understanding and attention to the issue.

Research instruments

Action plan (Appendix E) was used to guide for implementing the fall prevention model. It was developed by the community, which consisted of six components including: 1) multifactorial fall risk assessment, 2) fall campaign, 3) education program, 4) exercise group, 5) home visit, and 6) fall management system.

4.2.4 Evaluation

This step was conducted to evaluate the fall prevention model. It assessed the fall risk factors among older adults and the partnerships among community networks.

Research procedures

1. After implementing the action plan, the older adults who participated in more than 80 % of program activities were assessed for their fall risk factors and satisfaction of this program.

2. Participant observations and field notes were analyzed and the process of model development and implementation was evaluated. The data from participant observations and field notes were analyzed to provide input regarding 1) construction of the fall prevention model, 2) the surveillance system and fall screening tools in the community, 3) the community safety management system to promote fall prevention, 4) health promoting activities surrounding fall prevention such as health education and exercise balance training class, and 5) the collaborations using the action research approach.

3. Conducting group discussion among research team to evaluate the fall prevention model in the community

4. The partnership checklist was send to partners of fall prevention model in the community including the Dusit district office, the Crown Property Bureau, the 6th public health center, Sukantaram temple, and Rachawat market.

Research instruments

There were two instruments in evaluation step, were described following:

1. Data collection instrument used in situation analysis to measure the risk of fall among older adults after implementation, consisted of five instruments including 1) demographic data and history of fall, 2) the Thai Fall Risk assessment Test (Thai-FRAT), 3) fall prevention behavior questionnaire, 4) environment hazard assessment, and 5) physical performance test. The questionnaires and testing took around 30-40 minutes to complete.

2. Partnership checklist

The partnership checklist, developed by Victorian Health Promotion Foundation (2008), was modified to measure the success of partnerships and provide

feedback on the current status of partnership. Seven areas of concern in the checklist are 1) determining the need for the partnership, 2) choosing partners, 3) making sure partnerships work, 4) planning collaborative, 5) implementing collaborative action, 6) minimizing the barriers to partnerships, and 7) reflecting on continuing the partnership. It consists of 5 rating levels of agreement with each statement from 0 indicating strong disagreement and 4 indicating a strong agreement. The total score ranged from 0-140 real score, categorized to three level of the partnership as followed: 0-49 means the whole idea of a partnership should be rigorously questioned.50–91 means the partnership is moving in the right direction but it will need more attention if it is going to be really successful; 92–140 means a partnership based on genuine collaboration has been established and the challenge is to maintain its impetus and build on the current success. This instrument was translated and adapted the questions specific in fall prevention program by the researcher which there was validated the content by four experts with CVI = 1.00. This tool used to evaluate the community awareness and participation of community and the level of relationship with partners in this study. The researcher asked partners to complete the evaluation form and identified the level of partnership following the criteria as mentioned above (Appendix D).

The preparation of research assistant

To ensure timely completion of data collection, research assistants were required during this study. They were trained on the research objectives, data collection methods and procedure, and the technical skills for specific measurements, including fall risk assessment and testing. They were also trained to perform participant observations and to take field notes.

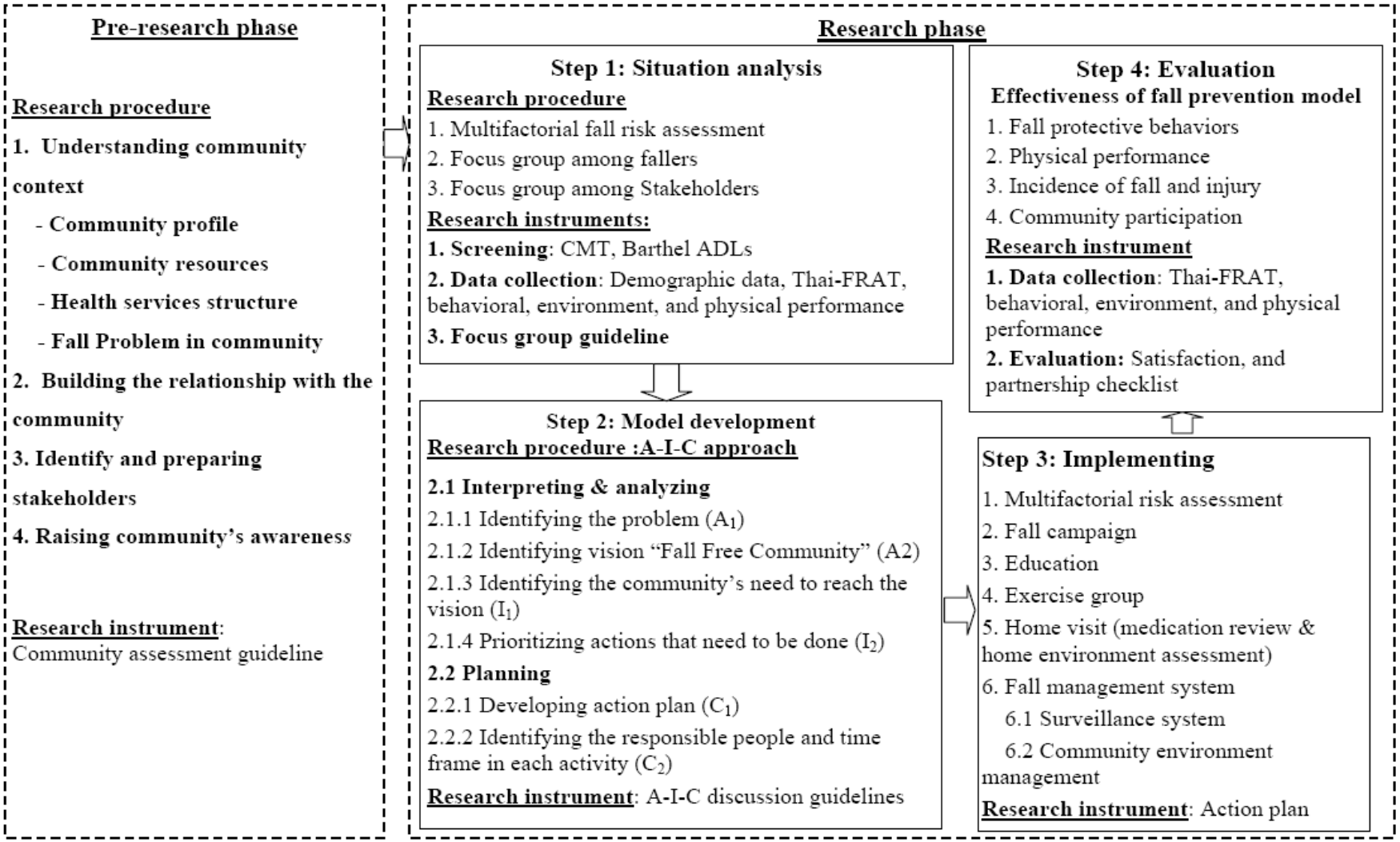

Figure 3.2 Research instruments and research procedures in this study

5. Protection of Human Subjects

Data collection was commenced following approval by the committee on Human Rights related to Human experimentation at Mahidol University and the Bangkok Metropolitan Association. After proposal approval was obtained, a permission letter for data collection from the Faculty of Public Health and Bangkok Metropolitan Associationwas sent to the health care center, elderly clubs and the study community. Eligible participants are identified by the researcher and public health nurses, the older adults who met study inclusion criteria were sent a letter inviting them to participate in the research study and explained the purpose and the process in this study. The participants were asked to complete a written informed consent (signed or thumb printed) and received a written copy of this consent. Throughout the study process, participants maintained the right to protection from the possibility of discomfort, interference, or excessive burden. In addition, participants were assured they could terminate their participation at any time or refuse to answer question to which they object. They received assurances they their decision to participate in the project would not be affect access to health care services. A decision to discontinue participation in the study would not affect the relationship between the participants and health care providers or any services available.

6. Data Analysis

Data analysis was described following two research objectives as follows.

6.1 The quantitative and qualitative data analysis were used to identify the fall risk factors in older adults for developing a community-based fall prevention model, as followed.

1) Descriptive statistics were used to describe demographic data of older adults in the community.

2) Chi-square test was used to evaluate the relationship between fall risk factors including personal factors, physical performance, and environment factors and fall among older adults in the community.

3) Independent-T-Test and Mann-Whitney U Test were used to evaluate the difference of fall risk factors including behavioral factors and physical performance between fallers and non-fallers.

4) Content analysis was used to analyze data from focus group among fall victims and stakeholders to identify the fall risks factors in the community. The steps of analysis (Bergh, Jakobson, Sjostrom & Steen, 2005) following:

All tape recording of focus group discussions were transcribed verbatim. The researcher read all the transcripts to understand and interpret the data. The researcher coded the data word by word in order to extract the reference. Next, the researcher coded the data line by line to identify the concepts and context. The data with the same code would be categorized in the same group. Lastly, the researcher formulated themes, defining the approaches and refining the process and comparison of the themes.

6.2 The quantitative data analysis was used to examine the effectiveness of fall prevention model including changes inprevention behaviors and physical performance, as followed.

1) Paired T-Test wasused to examine the difference of means score of fall preventionbehaviors at baseline (T1) and after implementation (T2).

2) Wilcoxon Signed Rank Testwas used to examine the difference of means score of physical performance including handgrip strength, Five Times Sit to Stand (FTSS),and Timed “Up &Go” (TUG) of older adults who participated in this study at baseline (T1) and after 12 weeks of exercise training (T2).

3) McNemar Test was used to examine difference of tandem stand ability at baseline (T1) and after 12 weeks of exercise training (T2).

A triangulation technique was used in this study by combining the quantitative data and qualitative data collection because fall related with multiple factors and there was interaction among those factors. The quantitative data helped to identify the most risk factors that related with fall in the community while the qualitative data helped to confirm and more understanding the fall phenomena and interaction of fall risk factors. This research process started with quantitative approach. Based on the findings of the first techniques, the qualitative approach was conducted, respectively.The results are presented in Chapter 4.

CHAPTER IV
RESULTS

This action research study was conducted to develop a community-based fall prevention model for Thai older adults, living in an urban community. Effectiveness of the community-based fall prevention model was measured in terms of 1) reducing the risks of fall and fall-accident, 2) increasing fall prevention behaviors, 3) improving physical performance of older adults, and 4) developing fall management system in the community.This chapter presented 1) community context of Sukantaram Road community, 2) situation of fall in Sukantaram Road community, 3) model development: community-based fall prevention model, 4) model implementation, and 5)model evaluation

1. Community context of Sukantaram Road community

1.1 Community profile

Sukantaram Road community was an urban community, located on Sukantaram Road in Dusit district, Bangkok. During fifty years, the community became the overcrowded community because the people migrated from countryside to city. The community covered the area of approximately 9 rai, consists of 1,900 people with 400 households (Social development department Bangkok Metropolitan Administration (BMA), 2010).There were two major groups of people in this community. First, the majority of people in the community were migrated people which had the census on their countryside home (non-registered population). They just rented the houses for living in this community. Most of them worked as a tricycle driver and a taxi driver in men and general mercenary such as seamstress in women. Second, the local people who had census in this community (registered population), which were older adult population.The numbers of women (52%) were of

more than men (48%). Married (49%) and single (41.2%) were reported a marital status people in this community, respectively. Most of them were Buddhism (99.8%) and had primary education (33.2%). The economic status of those people was poverty to middle-class. Most of them (46.6 %) had family income less than 10,000 baht per month. Regarding health insurance, most of them (61.4%) had universal coverage as a health insurance.

The characteristics of houses in this community were wooden, cement, and small rentroom, respectively. Most area of the community was housing for living; however housing around sidewalk were food shop, grocery shop, and garage as a result of obstructed and narrowed walkway in the community. Moreover, the majority of walkway in the community were damaged from the big tree root and subsided of the pavement.These reasons contributed to the uneven walkway throughout the community. In addition, there were many cars in the community parking on the road alongside the walkway in the community which most of them were taxi and tricycle.

Since most people were non-registered population, there was less sense of community and participation in community activities.The secondary data showed less than six percent of people (5.8%) participating in community activities.The majority of people who participated in community activities were older adults. They were local people which lived in this community for a long time. These people had sense of community and aimed to improve their community. Thus, it found that all of community leaders were local people which most of them were older adults.

There were both formal and informal leaders in Sukantaram Road community. The formal leaders consisted of 16 community committees which they were local people. The community boards were selected by voluntary to help their community and registered of Dusit District Office.They have to vote the chairperson every 2 years. Regarding informal leaders, they were local people and previous leaders including the Abbot of Temple, Temple warden, garage owner. All of them were older adults and initiated persons for establishing elderly club in the community. In addition, they were leaders to support community activities especially older adult activities.

Regarding older adults in the community, the previous report showed the numbers of older adults who lived permanently were 102 people, 40 persons were male and 62 persons were female. It showed the high proportion of older adults in this

community (17.8 %). Most of them were widowed, divorced, separated and lived with child and grandchild. Regarding health status, approximately seventy-two percent (72%) of older adults had at least one chronic condition which most common disease were hypertension (50%), diabetes mellitus (23%), and hyperlipidemia (16.61%), respectively. Seventy percent of them (70%) received health screening every year.

Regarding fall problem of older adults in this community, it reported that thirteen percent of older adults (13%) reported fallen more than 2 times in 3 months in 2009. Most of older adults in the community concerned about their health and their symptoms. They emphasized to followed up their health at the hospital and taken their medication following physician's prescription. They received health screening and chronic care services by 6th public health center. There was the existing system to take care chronic illness patients in the community, however it had not the services or system to take care older adults regarding fall problem that was an existing problem among older adults in this community.

The sources social support among older adults in this community included family, neighborhood, community leader and elderly club president, PHN, and PHVs. Regarding informational support, older adults get the informational regarding health and fall prevention in the community from community leader (43.6 %), neighborhood (38.5%), and PHVs (35.9%), respectively.The family was identified as a common emotional support (48.7%) when they feel worried whereas neighborhood (30.8%) and PHN (23.1%) were identified as a second and third emotional support, respectively. Instrumental support when they would like to change their environment, older adults get the support from their family (61.5%), a community leader (25.6%) and neighborhood (23.1%), respectively. Regarding appraisal support, the people who motivated older adults participating in community activities included a community leader (56.1%), PHVs (51.2 %), and neighborhood (31.7%), respectively.

Elderly club was an existing group of older adults in this community. It was founded since 2007 by 4 older adults who had worked experiences as community leaders. It was a non-registered club and independently. The members of this club have been increasing from 40 members to 170 members until now. Members spent thirty baths per month per person. Most of older adults in the community (80%) were membersof elderly club. This club aimed to help older adults in their community

which elderly club member had visiting the member who admitted at the hospital and conducting the funeral event when they died. In addition, there were 2 major activities each year including 1) annually meeting and health screening for members on October 1st (The International Day of Older Persons), and 2) field trip for older adults.The first activities was supported by PHN who was responsible in this community and 6thpublic health center while Non-Formal and Informal Education supported the field trip yearly for older adults in elderly club. These activities represented the strength of elderly club in this community which was leading to building trust and acceptance among the elderly club from older adults in the community.

Sukantaram temple was a center for meeting of people in this community especially in older adult population. Older adults had meeting every "Buddhist Sabbath" and "Buddhist holiday" at the temple. There was sharing and talking together about their life and their health. Most common activities were conducted in the temple such as Songkran festival, health screening of older adults, and elderly club meeting.

1.2 Community networks

There were four major organizations that had responsibility to work with and support activities in this community including 1) the Crown Property Bureau, 2) the Dusit District Office, 3) the 6thpublic health center and 4) Dusit police station. In addition, there were other networks which provided the occasional supportive in this community including 5) Military unit, 6) Non-Formal and Informal Education Center 7) Local Politician 8) Faculty of Medicine Ramathibodi Hospital, Kuakarun Faculty of Nursing, University of Bangkok, and Prasat Neurological Institute. 9) Contacted hospital including Phramongkutklao hospital, Faculty of Medicine Vajira Hospital, Royal Medical Division Grand Palace, and Center Hospital (Figure 4.1).

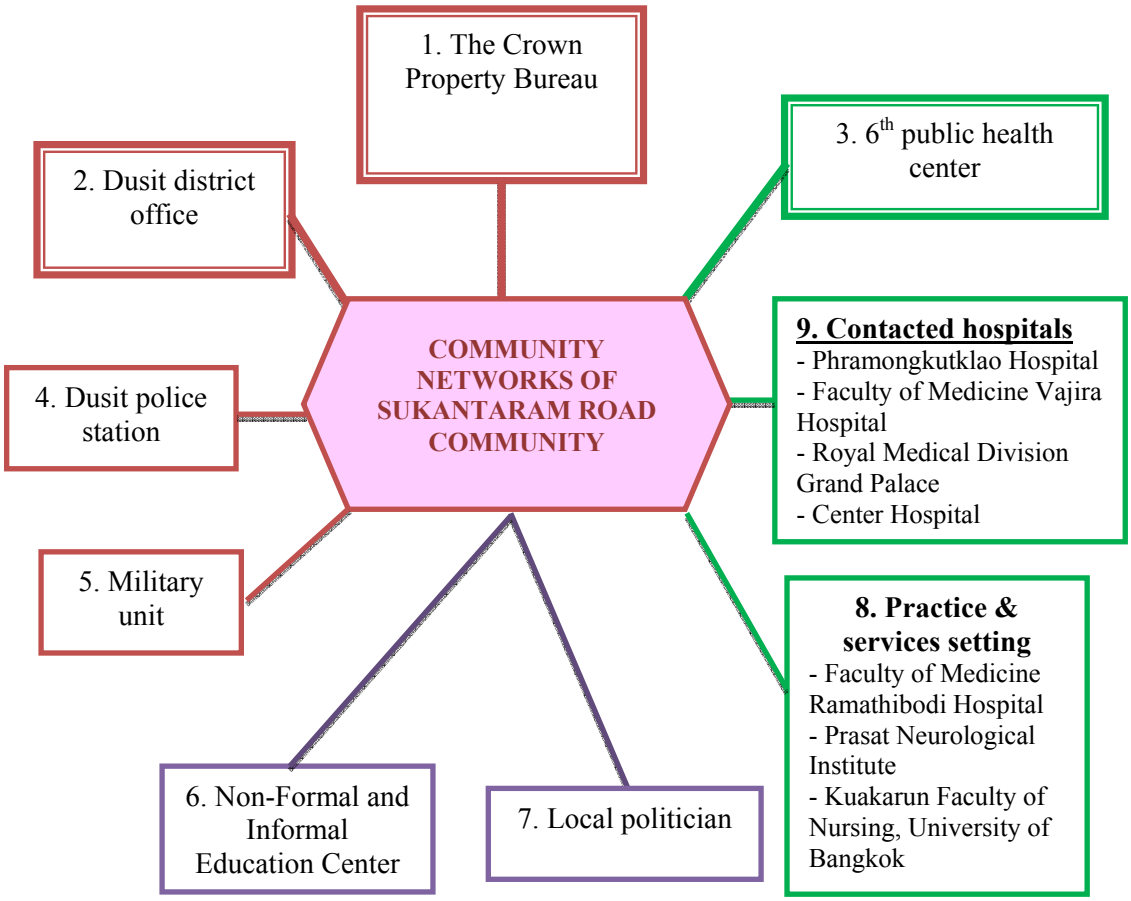

Figure 4.1 Networksof Sukantaram Road community

1) The Crown Property Bureau

The Crown Property Bureau was a major resource in this community because this community area was under the Crown Property Bureau's land. The people in the community paid the rent monthly for living in this area and extend a contract every 3 years. Moreover, the Crown Property Bureau had organization which had policy to support for community development regarding social and economic development especially in overcrowded urban community. In 2007-2009, they conducted the project for developing the quality of life of people in the community emphasized on environmental development such as road organizing, grease trap for food shop, waste pipe on the plant or tree area for organic fertilizer. Moreover, they conducted the house permanently loan foundation project for people in community aiming to support renovation of their house by loaning the money in this foundation. In addition, all people need to ask permission from this organization before repairing

or modifying their house. However, all of projects which were provided by this organization depended on their policy at that time. Previous projects of this organization emphasized on environment which had not the project that related with health and older adults in this community.

2) Dusit district office

This community was governed by the Dusit district office under Bangkok Metropolitan Administration (BMA). This community was registered under this organization. Dusit district office had responsibility for community management and community development. The committee in this community must register to this them. This organization had responsibility for utilities services such as waste management, environment management including road and sidewalk, etc. In addition, they supported community to arrange some culture cerebration such as Father's Day, Mother's Day, Songkran festival or Thai-older person day etc.

3) 6thpublic health center

The 6th public health center, which was governed by BMA, was the primary health care center in this community. They had responsibility to provide health services including home visit, health screening, health promotion, and health prevention. In addition, primary care unit (PCU) and public health volunteer (PHV) of this community were governed by this public health center. The primary care unit was located at the center of community, which provided basic health services by public health volunteers (PHV) in the community.

Public health volunteer (PHV) was a primary health care worker which had responsibility for basic screening such as blood pressure checking by using automatic blood pressure monitor,basic dressing, as well as basic medical prescribing such as acetaminophen, chlorpheniramine, antacid, M.carminative etc. They also worked as a health reporter and coordinator in the community, which were assigned responsibility to take care people following population groups such as newborn group, child group, pregnancy group, disability group, and elderly group.

4) Dusit police station was responsible for public safety in this community. Moreover, they had setting the justice network center in this community.

5) Military unit supported occasional activities such as providing electrical appliances reparation by free of charge.

6) Non-Formal and Informal Education Center was located in the community nearby the Sukantaram Temple. They had policy to support some activities for older adults in the community, which they contacted with elderly club including annually meeting and field trip.

7) Local politician supported some activities occasionally depending on community asking for help such as New Year Celebration, Songkran festival or Thai-Older Person Day, etc.

8) Practice and service settings, Ramathibodi hospital and Kuakarun Faculty of Nursing used this community as a practice setting for community diagnosis and home visit. Regarding Prasat Neurological Institute, they provided risk screening for cerebrovascular accident disease to people in this community every year.

9) Contactedhospitals were hospitals which the people had the universal coverage included Phramongkutklao Hospital, Faculty of Medicine Vajira Hospital, Royal Medical Division Grand Palace, Center Hospital, respectively.

2. Situation of fall in Sukantaram Road community

Situation analysis of fall among older adults in this community was conducted to more understanding of fall phenomena in the community. The results of situation analysis were summarized as 1) characteristic of participants, 2) fall situation, and 3) fall risk factors.

2.1 Characteristic of participants

As shown in Table 4.1, there were total of 41 participants, with the mean age of 72.93±6.35years, ranging from 62 to 86 years. Thirty-one participants (75.6%) were women and ten participants (24.4%) were men. The majority of participants (43.9%) were married and widowed, divorced, or separated. Twenty-eight participants (68.3%) had primary school education. More than half of participants (65.9%) were housewife and 22% were business. The majority of participants (46.7%) had monthly income less than 3,000 baht, receiving from their children or grandchildren (34.1%) and themselves (29.3%). Most participants (51.2%) had universal coverage.

Table 4.1 Number and Percentage of older adults classified by general characteristics (n = 41)

Characteristics of the Participants	Frequency	Percentage (%)
Age (years) (Range = 62-86, Mean = 72.93, S.D. = 6.35)		
60-69	12	29.3
70-79	23	56.1
≥ 80	6	14.6
Gender		
Male	10	24.4
Female	31	75.6
Marital Status		
Single	5	12.2
Married	18	43.9
Widowed, Divorced, Separated	18	43.9
Level of Education		
No formal education	1	2.4
Primary school	28	68.3
Secondary school	10	24.4
Bachelor degree	2	4.9
Occupation		
Housewife	27	65.9
Business	9	22.0
Employee	5	12.1
Income (Baht/month)		
< 3,000	49	46.7
3,001-5,000	26	24.8
5,001-8,000	17	16.2
8,001-10,000	5	4.8
> 10,000	8	7.5

Table 4.1 Number and Percentage of older adults classified by general characteristics (continued)

Characteristics of the Participants	Frequency	Percentage (%)
Source of income		
Children or grandchildren	14	34.1
Own income	12	29.3
Social work	8	19.5
Pension	4	9.8
Others	3	7.3
Health Insurance		
Universal coverage by Government	21	51.2
Original affiliation	18	43.9
others	2	4.9

2.2 Fall situation among older adults in the selected community

As shown in Table 4.2, the overall prevalence of fall was 31.7 per 100 persons in the last year which a half of fallers (46.2%) were fall recurrently. In addition, the proportion of fall among age group showed that older adults ranged 70-79 years (34.8 %) and over 79 years (33.3 %) had fall prevalence higher than 60-69 years (25 %). However, there was no difference the proportion of fall among gender by it showed 32.2 % in female group and 30 % in male group.

Regarding characteristics of fall, slipping and tripping were common causes of fall among older adults in this community. Almost a half of fallers occurred from slipping (46.1%) and tripping (23.1%), respectively. Most fallers fell outside the home (69.3%) including in front of home, market, and public place. Most slipping and tripping occurred at outside the home which a half of slipping occurred at market (50%) which located nearby the community while most tripping occurred at the walkway in the community (66.7 %) . However, the sitting room (30.7%) was reported as the common area of fall which occurred from uneven floor around inside the home. All of fallers reported falls at the day time.

Table 4.2 Fall situation among older adults in the selected community (n=41)

	Types	Frequency	Percentage (%)
History of fall	Yes	13	31.7
(within 1 year)	No	28	68.3
Number of fall	1	7	53.8
	2	3	23.1
	> 2	3	23.1
Cause of fall	Slip	6	46.1
	Trip	3	23.1
	Uneven floor	2	15.4
	Others	2	15.4
Place of fall	Outside	9	69.3
	Inside	4	30.7
Area	Sitting room	4	30.7
	In front of home	3	23.1
	Market	3	23.1
	Public place	3	23.1
Injury	Moderate injury	11	84.6
	Serious injury	2	15.4
Treatment	No hospital visit	9	69.3
	Visit emergency room (ER)	4	30.7

Regarding fall related injury, approximately eighty five percent (84.6%) of fallers get moderate injury including bruising and sprains while the serious injury (15.4%) wasthe fracture. However, most of them (69.3%) took care by themselves and did not visit at the hospital whereas thirty-one percent (30.7%) of fallers reported visiting at emergency room (ER).

2.3 Fall risk factors

Fall risk factors were assessed both quantitative data among older adults who lived in the community and qualitative data among older adults who had experienced of fall. Quantitative data was collected by using multifactorial fall risk

assessment and physical performance test. In addition, focus group was conducted to gain understanding of fall phenomena in the community as a qualitative data collection. The results were described the quantitative data to qualitative data following personal factors, behavioral factors, and environment factors.

2.3.1 Personal risk factors

Characteristic of fallers in this community showed that approximately sixty-two percent (61.5%) of fallers were aged range 70-79 years. Most of them (76.9%) were female (Table 4.3). All of fallers had health problem at least one disease and had taken medication. In addition, almost a half of fallers (46.2%) had taken drug four or over types per day. Nearly a half of fallers (46.2%) also reported their balance problem whereas approximately one third of fallers (38.2%) reported incontinence, insomnia, muscle weakness and vertigo symptom at least 1 time a week in the last month. Regarding vision problem, forty-six percent of fallers (46%) had visual acuity lower than 20/40 whereas approximately one third of them (30.8%) reported unclear eyesight and having eye disease including cataract and glaucoma.

Independent t-test was used to examine the difference of mean age between fallers and non-fallers. Although the mean of age among fallers (74.77±6.31) was higher than non-fallers (72.07±6.30), there was no statistical significant difference of age between fallers and non-fallers. In addition, Chi-square test was use to examine the association between other personal factors and fall, it showed that age group, gender, health problem, medication use, symptoms, and visual ability were not statistically significant associated with fall among older adults in this community.

Table 4.3 Number and Percentage of older adults classified by personal risks (n = 41)

Risk factors	Fallers (n=13) Freq. (%)	Non-Fallers (n=28) Freq. (%)	All (n=41) Freq. (%)	Test statistics	p-value
Age(Range)	64-84	62-86	62-86		
(Mean±SD)	74.77±6.31	72.07±6.30	72.93±6.35	t =1.276 [a]	NS
60-69	3 (23.1)	9 (32.1)	12 (29.3)	.352[b]	NS
≥ 70	10 (79.9)	19 (67.9)	29 (70.7)		
Gender				.018[c]	NS
Male	3 (23.1)	7(25)	10 (24.4)		
Female	10 (76.9)	21(75)	31 (75.6)		
Health problem	13 (100)	23 (82.1)	36 (87.8)	2.64[c]	NS
Medication use	13 (100)	23 (82.1)	36 (87.8)	2.64[c]	NS
Multiple drugs (≥ 4/day)	6 (46.2)	10 (35.7)	16 (39)	.407[b]	NS
Unclear eyesight	4 (30.8)	13(46.4)	17(58.5)	.897[b]	NS
Eye disease	4 (30.8)	8 (28.6)	12(29.3)	.021[c]	NS
VA < 20/40	6 (46.2)	16 (57.1)	22(53.7)	.511[b]	NS
Symptoms					
Balance problem	6 (46.2)	13 (46.4)	19(46.3)	.158[c]	NS
Insomnia	5 (38.5)	10 (35.7)	15(36.6)	.000 [b]	NS
Incontinence	5 (38.5)	9 (32.1)	14(34.1)	1.312 [b]	NS
Muscle weakness	5 (38.5)	9 (32.1)	14(34.1)	.158[c]	NS
Vertigo/Dizziness	5 (38.5)	6 (21.4)	11(26.8)	.029[c]	NS
Fatigue	4 (30.8)	7 (25)	11(26.8)	.151[c]	NS

Value in brackets represented percentage within group

[a]Independent-test[b]Chi-squaretest,[c]Fisher's exact test

Nevertheless, the results of focus group among fallers showed that older adults who had fallen perceived their health problems and their medication use were related with their fall. Moreover, they perceived that they often encountered with many symptoms including fatigue, dizziness and vertigo when they get old or took some medication. These symptoms affected their balance ability that related with their fall, for example:

Female 1: "I think when we get older we encountered with many problem such as fatigue, health problem, dizziness, and changing walking ability. These changing affected older adults were susceptibility to fall than others"

Female 2: "When I get older, I was often fatigue and dizziness. I needed to take some medication for solving these symptoms".

Female 3: When I get cold, I took some medication. Then, I felt dizziness and vertigo which affected me to loss of balance and fall. Sometimes, I needed to take a nap until I feel better."

Regarding physical performance, Mann-Whitney U Testwas used to examine the difference of physical performance among fallers and non-fallers group (Table 4.4). The results showed that faller group had lower physical performance than non-faller group with statistically significant including Five Times Sit to Stand (FTSS) (Z= 2.58, P<.05), Turn 360 degree (Z= 2.62, P<.01), and Timed "Up &Go" (TUG) (Z= 3.05, P<.01). Although faller group had the mean of handgrip strength (18.73±4.65) lower than non-faller group (21.50±8.13), it was not statistical significant difference of handgrip strength. Similar to tandem stand test, there was no statistical significant difference of full tandem stand among faller and non-faller.

When using cut-off point of physical performance to risk of fall based on previous studies and Chi-square test was used to examine the association between physical performance and fall. The results showed that there was statistically significant association between fall and Five Times Sit to Stand (FTSS) ($\chi 2 = 4.14$, P<.05), Turn 360 degree ($\chi 2 = 8.50$, P<.05), and Timed "Up &Go" (TUG) ($\chi 2 = 8.84$, P<.01). However, fall was not associated with handgrip strength and tandem stand.

Table 4.4 Number and Percentage of older adults classified by physical performance (n = 41)

Risk factors	Fallers Freq. (%)	Non-Fallers Freq. (%)	All Freq. (%)	Test statistics	p-value
Handgrip Strength					
(Range)	9.50-28.50	10-40	9.50-40		
(Mean ± SD)	18.73±4.65	21.50±8.13	20.62±7.26	.645 [a]	NS
Risk of fall (≤ 18 kg)	6 (46.2)	18 (43.9)	12 (42.9)	.039 [b]	NS
Five Times Sit to Stand					
(Range)	15-29	8.44-31	8.44-31		
(Mean ± SD)	21.15±5.35	16.74±5.87	18.14±6.01	2.582 [a]	< .05
Risk of fall (>15sec.)	10 (76.9)	22(53.7)	12 (42.9)	4.143 [b]	< .05
Turn 360 degree (Sec.)					
(Range)	2.24-10.41	1.84-9.43	1.84-10.41		
(Mean ± SD)	5.50±2.14	3.87±2.04	4.39± 2.18	2.620 [a]	< .01
Risk of fall (> 3.8sec.)	11 (84.6)	21(51.2)	10 (35.7)	8.497 [b]	< .01
Timed "Up&Go" (Sec.)	12.06-34.84	9.34-55.59	9.34-55.59		
(Mean ± SD)	20.67±6.75	15.43±8.98	17.10±8.61	3.054 [a]	< .01
Risk of fall (>12 sec.)	13 (100)	28 (68.3)	15 (53.6)	8.838 [c]	< .01
Tandem Stand (Unable)	4 (30.8)	9 (32.1)	13 (31.7)	.008 [b]	NS

[a]Mann-Whitney U test, [b]Chi-squaretest, [c]Fisher'sexact test

Similarly, the results from focus group showed that older adults perceived their physical performance declined related with their falls including walking ability, muscle weakness, and balance problem, for example:

Female 1: "Actually, I saw the step however I couldn't across pass them. Then, I tripped it and fell down on the floor."

Female 2:"When I get older I had a balance problem, I often loss of balance"

Female 3: "My legs is not good, I felt unstable when I walked. I used cane for walking sometimes"

2.3.2 Behavioral factors

The mean of prevention behaviors among participants was 56.24±7.21, ranging from 36-67 points (Table 4.5). The results showed that the mean of prevention behavior among fallers (58.46±7.79) higher than non-fallers (55.21±6.82) but it was not statistical significant difference of behavioral risk factors among fallers and non-fallers. Considering cut-point of prevention behavior at 60 points with chi-square test, it showed that there was statistically significant association between prevention behaviors less than 60 and fall event (χ^2= 4.06, P<.05). Moreover, approximately eighty-three percent of them had no exercise regularly.

Although the quantitative data showed no significant difference of behavioral factors between fallers and non-fallers, focus group showed the behavioral factors facilitated the older adults became fall. The behavior risks that facilitated older adults falling including unawareness, hurrying, carrying both hands when they walk, and wearing appropriated shoes, for example:

Female 1: Because I am unawareness, I walked into the restroom. Because of slippery floor, I slipped at that floor and fallen.

Female 2: That day, I just woke up and hurried to go down I missed the last step of the ladder. Then, I fell down on the floor.

Female 3: "One day, when I was walking to cook, one hand I hold the inside cooker and another hold the box, I fell down because of my impaired walking ability. I didn't catch up something around there when I get lose a balance"

Female 4: "That day, I walked to the market with slipper shoes. I fell down at the market because I slipped at the wet floor area. I think, it occurred from my shoes which broken and no tread.

Table 4.5 Number and Percentage of older adults classified by behavioral and environmentalrisk factors(n = 41)

Risk factors	Fallers Freq.(%)	Non-Fallers Freq.(%)	All Freq.(%)	Test statistics	p-value
Behavior risks factors					
BehaviorsScore(Mean±SD)	58.46±7.79	55.21±6.82	56.24±7.21	1.374[a]	NS
Behaviors Score < 60	5 (38.5)	20 (71.14)	25(61)	4.055 [b]	< .05
Environment Factors					
General Environment					
Having step	9 (69.2)	22 (78.6)	31 (75.6)	.420[c]	NS
Having door step	7 (53.8)	14 (50)	21 (51.2)	.053[b]	NS
Stepping	7 (53.8)	16 (57.1)	23 (56.1)	.039[b]	NS
Slippery floor	4 (30.8)	4 (14.3)	8 (19.5)	.1.536[c]	NS
Obstructive way	3 (23.1)	6 (21.4)	9 (22)	.014[c]	NS
Reaching	1 (7.7)	6 (21.4)	7 (17.1)	1.183[c]	NS
Poor Lighting	0	1 (3.6)	1 (2.4)	.476[c]	NS
Having Pets	9 (69.2)	10 (35.7)	19 (46.3)	4.01[b]	< .05
Restroom Environment					
Slippery floor	3 (23.1)	9 (32.1)	12 (29.3)	.352[c]	NS
Always wet floor	2 (15.4)	10 (35.7)	12 (29.3)	1.772[c]	NS
No handrail	9 (69.2)	16 (57.1)	23 (56.1)	.545[b]	NS
Lavatory	7 (53.8)	11 (39.3)	18 (43.9)	.764[b]	NS
No anti-slip mat	2 (15.4)	10 (35.7)	12 (29.3)	1.772[c]	NS
Stepping Environment					
No step railing	1 (9.1)	2 (9.1)	7 (21.2)	.000[c]	NS
Damaged step railing	3 (27.3)	4 (18.2)	4 (12.1)	.363[c]	NS
Uneven step	0	1 (4.5)	1(2.4)	.516[c]	NS

[a]Mann-Whitney U test, [b]Chi-squaretest, [c]Fisher's exact test

2.3.3 Environment factors

There was statistical significant association between fall and having pets ($\chi 2 = 4.01$, $P<.05$) but there was no significant association between fall and other environment hazards (Table 4.5)

However, the results of focus group among fallers showed the environment hazards were factors related with their fall. Slippery floor, uneven floor, obstructed way, and stepping were common environment hazards that contributed to fall among fallers. The common place of fall included both home environment and community environment including damaged and obstructed walkway in the community, slippery floor at the market, slippery floor and uneven floor inside the home. Pet was also a cause of fall among older adults in this community, for example:

Male 1: "On the way I walked to the market I slipped on the floor that had water around there"

Female 1: "Almost areas of walkway in this community were uneven when I walked pass it, I tripped over there"

Male 2: "After raining day, I came back home. During I walked to go inside the home I slipped in front of my home because there was the water around there" Moreover, I wore the old slipper that was a cause of my slipped also

Female 2: I walked to the market every day. As we know, most area of the market was wet and slippery floor. I slipped at that place for two times. I also wore the slipper when I went there; especially the gradient area was the high risk area of fall.

Female 3: I walked around the Chitralada Royal with my dog, when my dog saw something, it barked and ran away. Then, I fell down.

In summary, approximately two months was used to complete situation analysis step with five meeting including two meeting for preparing fall risk assessment, fall risk assessment event, and two focus group discussions among fallers and stakeholders. It could summarize as following:

This community had a high prevalence of fall among older adults when compared with other communities. However, there was no existing system to manage fall in this study. From quantitative data analysis, the fallers were aged range 70-79 years (61.5%) and were female (76.9%). All of fallers had health problem at least one disease and had taken medication and a half of fallers (46.2%) had taken drug four or

over types per day and reported their balance problem. However, there was no significant difference of these factors among fallers and non-fallers.Only physical performance showed a significant risk factor that associated with fall among older adults in this community including Turn 360 degree, Five Times Sit to Stand (FTSS), and Timed “Up and Go” (TUG). Moreover, there was the significant difference of fall prevention behaviors among fallers and non-fallers, non-fallers had prevention behaviors lower than fallers. Regarding environment factors, having pets reported the significant factor which associated with fall in this community.

However, the qualitative data analysis showed that age and their health problem effect to their balance which facilitated older adults had fall in this community. Moreover, older adults had the risk behaviors which facilitated to older adults had fall including carelessness, hurrying, and wearing the inappropriate and damaged shoes wearing and lack of exercise regularly.Regarding environment factors, the common environment hazards which contributed older adults in this community get fall included damaged and obstructed walkway in the community, slippery floor at the market, slippery floor and uneven floor inside the home.

3. Model development: Community-based fall prevention model

The findings from A-I-C were summarized as Figure 4.2. The existing risk factors of fall among older adults which were identified by the community could summarize as followed.

1) The characteristics of older adults in the community were risks of fall. Most of them had chronic illness, taken medication habitually, and reported visual problem. In addition, one third of them reported any symptoms that related with fall.

2) Most of older adults had low physical performance which was a related risk factor of fall.

3) Older adults in the community had risky behaviors, including hasty and careless behaviors or hurrying, holding the things both hand, wearing inappropriate footwear and non-exercise regularly.

4) Environment hazards both home environment and community environment were identified as risk factors that contributing the fall among older adults in the community.

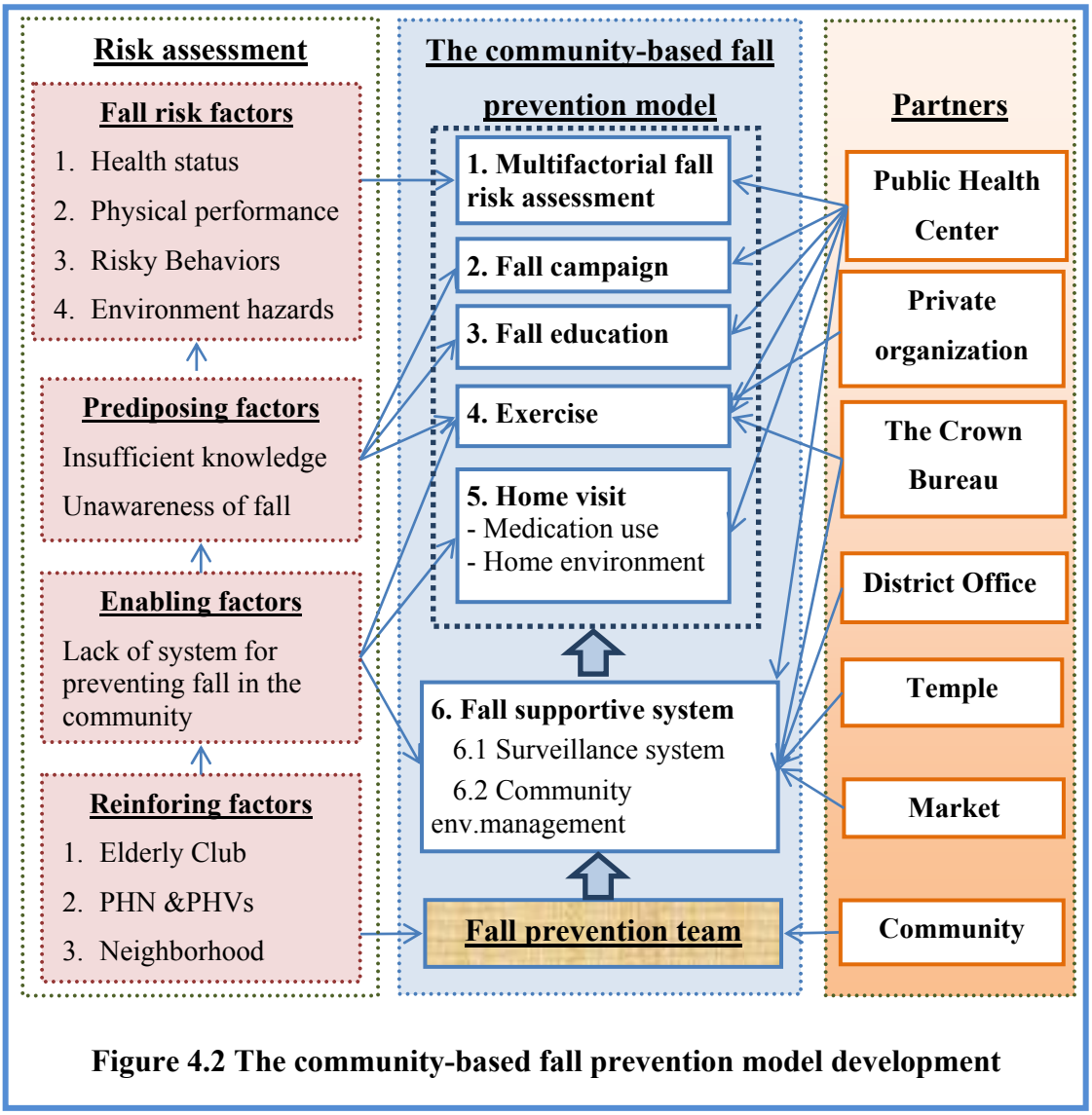

Figure 4.2 The community-based fall prevention model development

After getting fall risk factors, the contributing factors were identified by the community. It was useful to initiate and sustain behaviors among older adults in the community for preventing fall. The results were described as predisposing factors, enabling factors, and reinforcing factors, respectively.

Predisposing factors

Predisposing factors were the characteristics of individual that influenced motivate to change their behavior for preventing fall in the community. The results of focus group showed that older adults and community had insufficient knowledge and misperception of fall problem in the community including the cause of fall, negative impacts of fall, fall risk factors, and fall prevention strategies.

Older adults perceived that fall problem was a normal problem in older adults and couldn't preventable and individually problem which older adults needed to aware by yourself. In addition, older adults in the community didn't aware their risk behaviors which facilitated to fall, especially older adults who never fall. All of fallers reported that they didn't aware their behaviors and their environment when they doing daily activities until they get fall. Most of fallers learned their risk behaviors from their fall experiences while non-faller didn't aware about fall problem.

Enabling Factors

Enabling factors were the skills or the resources which it was necessary to facilitate behavioral and environmental change. The development the system and intervention were enabling factors to support the fall prevention in the community. The system and intervention that could support fall prevention following evidence-based fall prevention model (CDC, 2008) included there was fall risk assessment, vision screening, medication review, exercise activity, environment assessment and modification. Since this community was not concerned about fall problem among older adults in the community, there was no any existing system that supported fall prevention in the community. The example of quoting:

Reinforcing factors

The reinforcing factors that could encourage the people participate in the fall prevention model and maintain their behavior changes included:

1) This community had elderly club which there were sense of community and bounding among older adults in this club. Elderly club was reinforcing factor which can recruit the older adults in the community to participate in the fall prevention model and create other activities for benefit of older adults in elderly club.

2) The neighborhood was a reinforcing factor in this community especially in older adults. There was sharing the benefit of activities among neighborhood and persuaded together for trying the activities. It will reinforce the older adults participate in the fall prevention model

3) Public health nurse and public health volunteer were the key persons which effected to older adults in the community and facilitated older adults to participate in the fall prevention model.

In summary, although older adults had basic knowledge of fall risk factors from their experiences, they did not careful themselves to prevent fall because they had insufficient knowledge of fall problem. The fall problem and its negative impacts, and fall risk factors among older adults needed to provide to older adult and community for increasing awareness of fall problem. Moreover, the fall prevention strategies in the community regarding fall risk assessment and management, improving the prevention behaviors such as exercise and creating safety environment were also providing to the community. Elderly club, neighborhood and PHN and PHV were reinforcing factors to support activities for older adults to change and maintain their prevention behaviors and safety environment. The fall management system in the community was enabling factor for increasing self-awareness of fall, promoting prevention behaviors, and supporting environment hazards assessment and modification.

The community-based fall prevention model in this study consisted of six components including 1) multifactorial fall risk assessment, 2) fall campaign, 3) education, 4) exercise group, 5) home visit, and 6) fall management system. The reasons of each component were described following:

1) Multifactorial fall risk assessment was identified for assessing the fall risk factors among older adults in the community and identifying the high risk population in the community.

2) Fall campaign aimed to increase self-awareness of older adults and community's awareness. This activity was a strategy to initial raising self-awareness among older adults regarding fall problem and their risk factors. It was also raising community's awareness to concern about their environment hazards which facilitated older adults get fall in the community. In addition, this activity helped to inform the fall prevention project and recruit the target group participating in this project.

3) Fall education aimed to increase knowledge and self-awareness which leaded to prevention behaviors improvement. This activity was conducted because older adults in the community lacked knowledge of fall risk factors which leaded to risky behaviors among older adults. In addition, they also lacked of knowledge and skills to prevent fall by themselves such as exercise and environment management. This event also plan to recruit the partners and provided the information of fall

problem to them for increasing the understanding of fall problem and the existing risks of fall in the community.

4) Exercise group aimed to promote exercise regularly at least 3 times a week among older adults in the community. This exercise emphasized to strength and balance training which leaded to physical performance improvement. Exercise group was identified in this model because the results showed that most of older adults had poor physical performance and lacked exercise regularly. In addition, the member suggested that if we just promoted individual exercise at home, older adults did not exercise regularly. The exercise group would be effective way to promote exercise activity for older adults and improve the physical performance which was a significant factor that related with fall in the community.

5) Home visit aimed to assess home environment hazards and review medication use for older adults in the community. Since the medication review and home environment hazard needed health professional to assess and recommend older adults and family for risk assessment and management, home visit was identified as a strategy to manage risks regarding medication use and home environment. In addition, public health nurse was identified as a health professional that could help them in this activity.

6) Fall management system was established to monitor and manage the fall problem in the community was required to fall prevention model. The fall management system that identified by the community included: 6.1) fall notification center was identified as the center to notify the fall event and environment hazards in the community. The information from the record was used to monitor and design the intervention to solve the problem; and 6.2) environment hazard management system was identified for notification environment hazards in the community and management those environment hazards such as modification, and notification to responsible organization.

In addition, there were fall prevention team and five partners in this model. It was described following:

Fall prevention team

Fall prevention team was forming in the community, consisted of 7 zone leaders and environment leaders. All of fall prevention team was the people in the

community and 80% of them were older adults. 7 zone leaders were separated into 5 zones (Green, Blue, Orange, Violet, and Pink) responding 6-8 older adults per person. They defined their responsibility as to inform the news of fall prevention project to older adults in their zone and to conduct home visit with public health nurses for medication review and home environment assessment. Regarding three environment leaders, all of them had experienced for environment management. They had responsibility to assess and manage the environment hazards both home environment and community environment

The clarifying their role and older adult in their zones including "What is your team?", "How many older adults lived in their zone?", "Who is he?", "Where is their home?" were discussed in this time. After discussion, there was exchange some responsible people between zones because there was some conflict with their family or more familiar with those older adults. All of zone leaders were satisfied with their responsibility.

Partners of fall prevention model

The partners were also identified by members in this time. There were four organizations and two public places were identified as partners in this project including 1) the Crown Property Bureau, 2) 6th Public health center, and 3) Dusit district office 4) private organization 5) Sukantaram temple, and 6) Rachawat market.

1) The Crown Property Bureau was an organization which familiar with the community because it was the owner area of this community. It supported many activities in the community such as quality of life, stability house, and loan foundation. The community expected them to support fall prevention model regarding community environment including safety walkway, recreation area for exercise, and financial support for some activities.

2) 6th public health center was an organization which had responsibility for health care of people in this community directly. Except PHN which worked as a stakeholder in this community, it needed the support from her organization to participate in this project. Human and material resources were needed to support in this project. For example, PHN team for fall risk assessment, home visit nurses for following the fallers and media for education sessions (computer and projector).

3) Dusit district office was an organization that had responsibility for community environment. It was identified for supporting safety environment in the community.

4) Private organization was an organization for supportive funds or materials of fall prevention model.

5) Sukantaram temple was identified because it was a center for meeting and conducting some activities. Older adults in the community often went to the temple every week. It was identified to concern and support the safety environment for older adults in the community.

6) Rachawat market was identified because it was the public place nearby this community and older adults went to the market every day. Moreover, it was identified as a place that older adults often fell. It was identified aiming to make the connection for notifying their environment hazard and increase awareness of fall in older adults to the responsible people of this market.

Then, the action plan of fall prevention model was developed by the community including prioritizing the action, identifying the responsible people, and training fall prevention team (Appendix E.).

4. Model implementation

After getting the fall prevention model and action plan, the implementation of the model were launched to the community by fall prevention team, consisted of 1) multifactorial fall risk assessment, 2) fall campaign, 3) fall education program, 4) exercise group, 5) home visit, and 6) fall management system. The agreement among the fall prevention team for implementing this model included:

1) The fall prevention team had responsibility for working all activity following their action plan.

2) The public health nurse had responsibility for supportive the community in some activities of fall prevention model including education program, home visit, and fall risk assessment. In addition, PHN was a consultant of fall prevention model.

3) The researcher was a consultant and facilitator throughout the implementation. In addition, the researcher worked as the expert in some activities

including education program, trainer for exercise leaders, and the collaborator between fall prevention team and other partners.

The results of implementation were carried as followed:

1. Multifactorial fall risk assessment included the personal risks (age, gender, history of fall, health status and symptoms, medication use, visual acuity, and physical performance), fall prevention behaviors, and environment hazards. Public health nurse had a responsibility to support this activity for older adults while fall prevention team was an assistant to arrange this activity.

A total number of 41 older adults were assessed for risk of by public health nurses using Thai-FRAT. The results showed that 19 older adults had a high risk of fall and 22 older adults had low risk. Considering the modifiable risk, the results showed that 29 older adults had any poor physical performance and 27 reported medication use that related with fall, and 31 people had any home environment hazards, 22 had low visual acuity, 25 older adults had low prevention behaviors.All of participants had at least one risk factor. Then, all of participants were invited to participate in the fall prevention model.

2. Fall campaign aimed to increase self-awareness of fall among older adult and people in the community by introducing the project, fall notification center, and fall prevention team.

Regarding the preparation, fall notification center was set at the community health center which was located at the center of the community. This place was well known among older adults in the community. Older adults could notify their fall and the community hazards to this center and their zone leaders who lived nearby their home. The recording forms of fall incidence and community hazards were developed and distributed to the center and zone leaders. Medias and materials were developed for using in fall campaign event including polo-shirt of fall prevention team, leaflet and slogan and warning stickers.

Polo Shirt of fall prevention team was designed by the leader team for zone leaders to wear on the fall campaign event including the pattern of shirt, shirt color, and the logo on the shirt.

The leaflet was conducted for distribution on fall campaign day. Beside the information of fall prevention center and notification, the list of zone leader with their

mobile phone number and responsible area of each zone leader which they could notify their fall to those zone leaders was presented in this leaflet. The convincing fall prevention message including family and community participation also presented in the leaflet.

Slogan and warning stickers was also designed for distributing to the people in the community. The two slogans were designed to increase family and community awareness.

Family awareness:

Krob_kruaSai_jai (family had attention)

Nai_barnPlod_pai (home environment will safety)

Hog_lomHang_krai (a far from fall)

Soong_vaiPen_suk (older adults get well-being)

The meaning of Slogan: If the family pay attention, home environment will safety. Then, older adults had a far from fall and well-being

Community awareness

Tang_dernPlod_pai (walkway will safety)

Chum_ChonRoum_Jai (community had participation)

Peau_PooSoong_vai (doing for older adults)

Hang_Krai_Hog_lom (a far from fall)

The meaning of Slogan: if the community cares your environment for older adults, the walkways will safety. Then, older adults had a far from fall.

Moreover, the warning sticker including slip and trip caution which were the major causes of fall in the community was designed and prepared for fall campaign event.

Seven zone leaders wore the polo shirt of fall prevention team with public health nurse and the researcher, walked throughout the community and visited at older adults 'home and their family. Slogan and warning stickers were distributed to older adults and their family and people in the community. The invitation letters for participating in education program were distributed to older adults in the community.

Fall prevention team participated and organized their activities by themselves. There was convincing the older adults to participate in this project by zone leaders. Moreover, they convinced older adults' family to concern about fall problem

in their parents. Older adults interested in the project and accepted to participate in the fall prevention project. However, some older adults did not stay at home during fall campaign, so zone leaders responded to follow up those people.

3. Fall education program aimed to improve fall prevention and fall prevention behaviors among older adults leading to increase self-awareness of fall of older adults. In addition, the relationship between zone leaders and their older adults were strengthened.

Regarding the preparation, the coordination with partners was identified and assigned the responsible people for connection. PHV was assigned to asking permission for using the meeting room with Sukantaram temple. The researcher prepared invitation letter for the Dusit district office and the Crown Property Bureau to participate in this event which was collaborate signing signature from community leader, elderly club president, and researcher. Community leader was assigned to contact and send invitation letters to these partners also. Regarding PHN, she was assigned to prepare media instruments from the 6th public health center.

A total number of 40 persons participated in health education program, which were 30 older adults, two fall prevention team members, one PHN, two representatives of the Dusit district office (social worker and community development worker) and three representatives of the Crown Property Bureau (one head of community project 2 division, one head of community development department, and one community development worker). Older adults were asked to share their experience by asking and answering the questions and suggest fall prevention strategy. Exercise and home visit activities were set and discussed among participants. Balance and strength training exercise were chosen by older adults. The date, time and place were set and plan. In addition, there was building relationship among older adults, leaders, and partners. All partners presented the willing and assuring to support fall prevention program in this community.

After education session, data from participants, including 28 older adults and 4 representatives, showed that the participants had better knowledge of fall prevention than before the program ($Z= 4.47$, $P<.001$), which examined by Wilcoxon Signed Ranks Test.In addition, they perceived benefit was highest l (46.9%). Most of them satisfy of content (53.1%), document (40.6%), exhibition & boards (53.1%), and

appropriate place (40.6%) were high and appropriate time (37.5%) was medium. All of them who attended education session reported their benefit and commitment to participate in this project.

4. Exercise program aimed to promote exercise regularly at least three times a week. The exercise emphasized on strength and balance training which leaded to physical performance improvement. The exercise program was the strengthen and balance training exercise which adapted from (Barnett el al., 2003) with two times a week for group exercise and individually exercise daily at home. Group exercise training included 10 minute of warm-up, 30 minute of exercise training, and 5 minute of cool-down while home exercise daily consisted of 8 basic positions of strengthen and balance training (Barnett el al., 2003) (Appendix G).

The preparation of this component was described following:

1) Training the fall prevention team as the exercise leader in the group exercise.

2) Finding and preparing the community resources for supporting exercise group including using the in front of home area of a fall prevention team was a place of exercise, using the existing chairs' community that supported by local politician, and using CD-player of a fall prevention team as a media.

3) Developing poster and training media for group exercise activity and handbook and diary record of home exercise.

The exercise program consisted of the group exercise training combined with the home exercise daily. Group exercise training was conducted two times a week, every Wednesday and Friday at 10.00 a.m. at the in front of home's a fall prevention team. Regarding home exercise daily, there was distributing handbook of exercise daily and diary record for older adult. The dairy record was send to their zone leaders every time of group exercise.

In addition, there was identified partners to support exercise activity in this study included the Crown Property Bureau was identified to support stable chairs and the private organization was identified to support the canvas shoes. After connection with partners, the Crown Property Bureau supported 15 stable chairs while Wattana footwear supported 36 canvas shoes for older adults who participated in exercise program.

After two months, there were three activities to add up in the exercise group including 1) breathing exercise with the song (Dung Dog Mai Barn: Like Flowers) for warm up and cool down period of exercise, 2) Hand exercise to improve their health (Eight positions) which they found at Rachavithee hospital and believed that it could improve older adult's health, and 3) The ball exercise for improve coordination among older adults which was recommended by the researcher.

A total number of 28 older adults completed the exercise group regularly for three months (70%). There were 4 new comers to participate in the exercise group. In addition, all leaders team could lead and change to be an exercise leader in exercise group. There was a caution to older adults to be aware their fall during exercise every time, which there was no fall during exercise among older adults throughout the study.

Exercise group activity revealed the successful activity to sustain in this community. The leaders had so proud of this activity and invite some organization observing their activities. Moreover, older adults satisfied in this activity and there was talking together among older adults and sharing the benefit of this exercise that they feel healthy especially their balance and their gait ability and reducing their knee pain symptom. In addition, they also bring some food or drink to share older adults who attend the exercise group together. After three months, the numbers of older adults were 22-28 people in each day (> 80%).

Home visit and occasional event were strategies to recruit the participants in exercise program. Home visit was conducted for exploring the barriers and encouraging older adults participating in the exercise program. In addition, the occasional event, Songkran Festival Day was an example event in this study, was strategy for recruiting the older adults in the exercise group.

The barriers of older adults who couldn't attend to exercise group were their work and medical visit categorize into two groups that is 1) older adults who never attend the exercise group and 2) Older adults who attended the exercise group occasionally. The cause of first group included they have to work such as selling grocery, selling food, etc. which leader team encourage them to exercise regularly at home. Second group reported that they had followed up and get the medicine at the hospital especially older adults who had universal coverage needed to get the medicine every month.

5. Home visit included medication review and home hazards assessment among older adults in the community. Medication use and side effect that related with falls including dizziness, vertigo, fatigue, weakness, and loss of balance were assessed by PHN. Home environment hazards was assessed and recommended for older adults and their families to modify their hazards including inside home, stepping and restroom.

Regarding the preparation, PHN and fall prevention team were trained regarding the assessment and recommendation both medication reviews and home hazards management. Handbook of older adults and recommendation of home assessment and modification leaflet were also developed among fall prevention team.

Public health nurse and fall prevention team (zone leaders and environment leaders) visited older adults at home. A total number of 30 older adults (73.17%) were visited by PHN and fall prevention team, 6 households did not allowed the team to visit their home permission to visit at home because they lived with other people which they didn't admire someone to go inside. However, all of 27 older adults were reviewed for medication use and its side effect by PHN. Hypertensive drugs was a common medication use among older adults, 10 older adults reported dizziness and vertigo sometimes, they were advised by PHN regarding observing their symptom, changing position caution, consulting with their doctors if the symptom was not better.

Regarding home environment hazards assessment, a total number of 30 older adults were assessed home hazards and recommended to modify their home environment. The caution stickers (slip caution and trip caution) were posted on the hazards area. Moreover, questionnaire was used to follow up assessing home hazard environment from older adults who did not permission. The leaflet of home modification and cautions stickers were provided to them for recommendation.

The finding from home visit showed that the common home hazards of older adults in the community included 1) The obstructive way inside the homebecause of limitation place, 2) The characteristic of small home contributed to have narrow walkway, 3) The uneven floor and doorstep, non-smooth floor, and) lavatory toilet. The management of common home hazards in the community was described in the environment community hazards system.

6. Fall management system was the supportive system of fall prevention model aiming to monitor and prevent fall among older adults in the community. The fall management system in the community consisted of 2 components including:

6.1) Fall surveillance system was identified for monitoring the fall problem in the community. Fall notification center was set for notifying the fall events and environment hazards in the community. The information from the record was used to monitor and design the intervention to solve the problem. There was the guideline when they get the notification including PHN have to visited at faller's home to assess the fall phenomena and fall risk assessment, and referred to other organization if they had a problem. Moreover, the data from this record used to plan fall prevention activities in the next year including education session and fall campaign.

6.2) Environment hazard management system was identified for assessment and management environment hazards both home and community hazard such as modification, supportive materials, and notification to responsible organization. There was setting the environment leader team in fall prevention team for assessment and management environment hazard both home and community environment. Three older adults were identified as an environment leader team including 1) a community leader, 2) an elderly club president, and 3) an older adults who had experienced to modify their environment.

The reasons for choosing three of them were described:

1) Community leader had the experienced and power to contact with the organization especially the Dusit district office. He attended the meeting of this organization every month.

2) Elderly club president was a person who had knowledge about modification of home and community environment. Moreover, he was a temple warden, which had responsibility to developing the temple environment. He was the person who designed the environment for supporting older adults who came to the temple such as toilet and rail and others area within the temple.

3) Older adults who had worked experience as construction worker and modified his home environment (Step railing) for his wife. He volunteered to modify the home environment for older adults who would like to modify it by older adults just pay for the materials and free of services.

In addition, routine environment hazard assessment was set in the community yearly. The connection with related partners was also conducted for supportive safety environment including 1) Dusit district office, 2) Sukantaram temple, and 3) Rachawat market. The community environment hazard assessment was conducted by fall prevention team which consisted of zone leaders and environment leaders, fall prevention team took note and photo around hazards area throughout the community. The findings of community environment hazards were the obstructive walkway and uneven walkway throughout the community.

The management of environment hazards included home environment and community environment. It was described respectively:

1) Home environment hazards management

The list of most common home hazards and strategy to support older adults to modify their environment hazards were discussed among fall prevention team, PHN, and researcher. After discussion, there was plan to support home hazard modification included 1) spray color on the step, uneven floor and door step, 2) support anti-slip mat in the rest room, 3) support commode chair for older adults' home that had squatting toilet, and 4) suggest the resource to modify their home. These supports were informed to older adults. Older adults who required any support could request to fall prevention team. Then, fall prevention team prepared materials for supportive.

A total number of 20 households requested the anti-slip mat and 10 households permitted to spray color at the uneven step and doorstep in their home. Although there were 9 household had squatting toilet, it had limitation for using commode chair because there was a step on the basement of toilet. It needed the family to modify their floor and change to sitting toilet. Thus, older adults didn't require the commode chair. However, there was one household that renovate their toilet after home visit which was supported and modified by her children.

2) The community hazards management

There were the uneven walkway and obstructive throughout this community. The lists of community environment hazard were summarized and sent to the responsible organization for community hazards modification (the Dusit district office).

5. Model evaluation: Effectiveness of fall prevention model

Effectiveness of the community-based fall prevention model was examined in terms of fall incidence and fall-related injury, fall prevention behaviors, physical performance, community participation, and the satisfaction.

5.1 Fall incidence and fall-related injury

After completed implementation, the overall participants were 28 participants. Over 10 months follow-up period, there were 2 persons who reported falls incidence which the incidence is lower than The results showed that incidence is lower than after implementation (pre= 31.7 % VS post= 7.14, 24.56 % fewer).All of them got bruise on their knee and took care by themselves.

5.2 Fall prevention behaviors

The result showed that the mean of prevention behaviors at baseline (57.57±5.68) is lower than after completed implementation. In addition, Pair t-test was used to examine the difference of prevention behaviors at baseline and after completed implementation, the result showed that there was statistically significant improve of prevention behaviors after 3 month of implementation ($t = 8.255$, $P < .001$) (Table 4.9).

Wilcoxon Signed Ranks Test was used to examine the difference of each behaviors, it showed that there was a statistically significant improve behaviors after completed implementation including careful walking ($Z = 1.98$, $P < .05$), changing position ($Z = 2.16$, $P < .05$), hold the rail when they reach($Z = 3.04$, $P < .01$), exercise regularly($Z = 4.19$, $P < .001$), specific exercise training($Z = 4.11$, $P < .001$), non-slip floor caring($Z = 2.67$, $P < .01$),and facilities equipment($Z = 2.60$, $P < .01$).

Table 4.6 Comparison of fall prevention behaviors at baseline and after implementation (n = 28)

Variable	Mean±SD		Test statistics	df	p-value
	Baseline	After 12 weeks			
Behavior score	57.57±5.68	66.96±4.32	t= 8.255 [a]	27	< .001
Specific Behaviors					
- Careful walking	3.57±.92	3.93±.26	1.98 [b]		< .05
- Changing position	3.32±1.1	3.82±.47	2.16 [b]		< .05
- Hold the rail	2.57±1.37	3.57±.79	3.04 [b]		< .01
- Exercise regularly	1.96±1.23	3.68±.48	4.19 [b]		< .001
- Specific exercise training	2.00±1.21	3.64±.49	4.11 [b]		< .001
- Non-slip floor caring	3.07±1.13	3.79±.42	2.67 [b]		< .01
- Facilities equipment	2.93±1.33	3.71±.46	2.60 [b]		< .01

[a] Paired t-test, significant difference at P<.001

[b] Wilcoxon Signed Ranks Test

5.3 Physical performance

The physical performances of older adults were improved which consisted of handgrip strength, Five Times Sit to Stand ZFTSS), Turn 360 degree, Timed "up&go" (TUG), and Tandem Stand.

Wilcoxon Signed Ranks Test was used to examine the improvement of physical performance after completed implementation and complete exercise for 12 weeks (Table 4.7).

Although the mean of handgrip strength was slightly improved (Pre = 21.11±7.88, Post = 21.96±7.52), there was no statistically significant difference after 3 months of exercise training. Regarding Five Times Sit to Stand (FTSS), There was statistically significant difference of time to complete FTSS between baseline and 3 months (Z = 4.517, P <.001). Turn 360 degree was also improved, after 3 months of exercise training the older adults had significant time to complete the turn 360 degree

better than at baseline (Z = 3.097, P<.01). Similar to Timed "up&go" showed after 3 months was statistically significant better than at baseline (Z = 4.509, P<.001).

McNemar Test was used to examined Full Tandem Stand; it showed a statistically significant improvement of tandem stand after 3 months of exercise training (P<.05).

Table 4.7 Comparison of physical performance at baseline and after 12 weeks of exercise training. (n = 28)

Variable	Mean±SD		Test statistics	df	P-value
	Baseline	After 12 weeks			
Handgrip strength (kg)	21.11±7.88	21.96±7.52	1.849 [a]	27	NS
Five Times Sit to Stand (sec)	18.43±6.41	11.82±4.35	4.517 [a]	27	< .001
Turn 360 degree (sec)	4.06±1.93	2.98±1.12	3.097 [a]	27	< .01
Timed "up&go" (sec)	15.89±6.03	11.27±4.64	4.509 [a]	27	< .001
Tandem Stand[b]					< .05

[a] Wilcoxon Signed Ranks Test

[b] McNemar Test.

5.4 Community participation

Community participation was examined by the process of model development and the level of participation of the community, stakeholders, and partners to develop and support the fall prevention model activity.

The community-based fall prevention model was developed by community participation throughout the study including 1) identify the fall problem in their community, 2) set the vision, 3) design the solution for solving the problem based on existing data and evidence-based information from the researcher, 4) develop action plan, and implement those activities by themselves. In addition, there were fall prevention team and partnership organizations in this model.

The fall prevention team in the community consisted of 9 leaders for caring older adults of their zones and three leaders for environment management. PHN

was included in the fall prevention team as a consultant and a helper in some activity including home visit activity and risk assessment. Regarding the partner organizations in this model, it consisted of six organizations including 1) the Crown Property Bureau, 2) the Dusit district office, 3) 6th public health center, 4) Sukantaram temple, 5) Rachawat market, and 6) private organizations. The results of partnership among these partners had checklist score more than one hundred. It revealed that a partnership has been established which had challenge to maintain its impetus and build on the current success.

Considering the level of participation among partners following Himmelman (VicHealth, 2006), there was difference level of participation among these partners, which could summarized as Figure 4.3. It showed that public health center was collaborating partner which they collaborated with fall prevention team throughout the study and had responsibility to building capacity of fall prevention team. Moreover, PHN was a consultant of the project and controller of all activities in fall prevention model when the researcher withdrawn from the community.

Regarding the Crown Property Bureau, they were cooperating partner because it was an organization that emphasized to community development in their own place. There was sharing the resource for supporting fall prevention project. They were permission to renovate the in front of home that using for exercise group and support the stable chair for using in exercise activities.

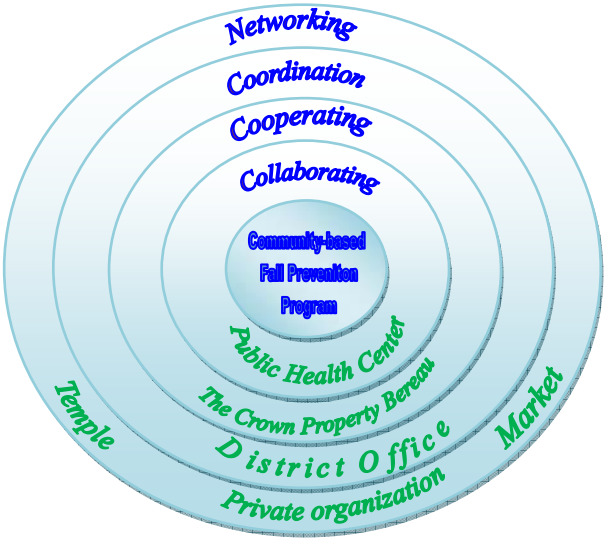

Figure 4.3 The level of participation among partner organizations of fall prevention model

Dusit district office was identified as a coordinating partner because they support and coordinate with the community to take care their environment for safety. They received environment hazard notification letter from community and permit to manage and modify those hazard environments.

Temple, market, and private organization were networking partners. Sukantaram temple and Rachawat market were the networks for notifying environment hazards in that place while private organization such as Wattana Footwear was the network to support material occasionally.

5.5 Satisfaction of older adults and fall prevention team for the community-based fall prevention model community

The results showed that the major of older adult (53.6%) had highest satisfaction of fall prevention model including exercise activity (64.3%) and risk assessment (60.7%) activity. In addition, most of them were high satisfaction for community environment activity (53.6%), partnership and social networks activity (50%), education activity (50%), and home visit activity (46.4%).

Regarding fall prevention team, all of fall prevention team had a highest satisfaction of the community-based fall prevention and perceived the successful of the fall prevention model implementation when compared with previous project including the activity of the program, the leader team, participation of older adults, and a continuous activity.Moreover, they had sense of ownership in this model because they were involved in the project at the beginning including identifying the problem, planning and developing the activities. In addition, they organized and managed the activity in this project by themselves.

There was perception of benefits of this project including individual benefit, elderly club benefit, and community benefit. Individual benefits were both physical and psychological benefits. Physical benefits included healthy, decreased knee pain symptom, improved gait and balance ability. In addition, happiness, less loneliness, and relaxation were reported as psychological consequences.

Regarding elderly club, fall prevention model was mentioned as the activity of elderly club also regarding it was the activity to take care the members in the elderly club. This benefit helped to strengthen their elderly club in the community.

Community benefits included the existing fall management system in the community, exercise group in the community, there were partnership of fall prevention in the community, and strengthening sense of community among participants. Moreover, they reported the highest satisfaction of fall prevention model in this study.

CHAPTER V
DISCUSSION

This community-based fall prevention model was developed through action research. The discussion of research finding was described following: 1) Fall situation among older adults in an urban community, Bangkok; 2) Process of model development; 3) Effectiveness of the fall prevention model; 4) Sustainability of fall prevention model; and 5) Key successful factors.

1. Fall situation among older adults in an urban community, Bangkok

The higher prevalence of fall was found in this study compared to the national data. The prevalence of falls of 31.7 per 100 persons was higher than that of Thai national survey report (18%) (NHSEO, 2009), but it was congruence with that of the previous study in Bangkok (34.3%) (Kittipimpanon, 2006). In addition, this result supported that the prevalence of fall in Bangkok was higher than other regions (Poomsawat, 2006). Regarding recurrent of fall, this study showed consistent results with previous studies, which reported that approximately 38.4-40 % of older adults had fall recurrently (Kittipimpanon, 2006; WHO, 2007). An urban community in Bangkok encountered with the poor environment and poor hygiene which leaded to several health problem in these communities. Health problems as well as environment hazards showed strongly related with fall among older adults, who lived in urban communities.

Similar to the previous studies, fall risk factors can be categorized into personal factors, environmental factors, and behavioral factors. However, no significant associations between general characteristics and fall were reported in this current study. The result showed that approximately 61% of fallers were aged range 70-79 years. In addition, older adult age ranged 70-79 years (34.8%) and over 79 years (33.3%) reported fall prevalence higher than those who were 60-69 years (25%).

Although there was the difference of the prevalence of fall among age groups, age was not significant associated with fall directly. This result was congruent with a previous study which there was no association between age and fall (Jitapunkul et al., 1998).

Although most fallers (76.9%) were female, the result showed no difference of fall prevalence among gender. This result was not congruent with the previous studies which reported the higher proportion of fall in female than male (Jitapunkulet al., 1998; Kitkumhang et al., 2006; Pasunan et al., 1998; Poomsawatet al., 2006; Thiamwong, 2001). It could explain that it occurred from the small number of male participants in this study and most of them had a history of fall.

Different from the previous studies, health problem, medication use, visual problem, and health related symptom were not related with fall in this study. From the situation analysis, it was showed that most participants reported having health problem (87.8%) and using fall-induced medication (87.8%). However, 53.7% of participants had low visual acuity and 46.2 % of fallers had low visual acuity. Older adults who had fallen perceived that health problems and taking some medication, such as hypertensive medication and anti-histamine, can lead to dizziness and fall.

It was not congruent with the previous studies (Hanjangsit, 1994; Jitapunkul et al., 1998; Pasunan et al., 1998; Thiamwong, 2001; Treeyawutiwat, 1991). However, from focus group discussion, health problem was indirectly identified as factors related to falls among older adults in the community.

However, there was a significant difference of physical performance between fallers and non-fallers at base line. Physical performance from 3 measures, including Five Times Sit to Stand (FTSS) ($t= 2.46$, $P<.05$), Turn 360 degree ($t = 2.64$, $P<.05$), and Timed “Up &Go” (TUG) ($t = 3.34$, $P<.01$) were significantly different between fallers and non-fallers at base line. There was no significant differences of handgrip strength and tandem stand test. However, older adults perceived decreasing of physical performance related with their falls including walking ability, leg muscle weakness, and balance problem. These findings showed similar result to that of the previous studies, which showed that fall was associated with physical performance including muscular weakness, poor balance, and low gait speed (Chandler et al., 1990; De Rekeneire et al., 2003;Pavol et al., 2002; SuZuki et al., 1999). Similar to Thai studies, walking or gait impairment was related to falls

among Thai older adults in urban communities (Jitapunkul et al., 1998; Kitkumhang, et al., 2006).

Although most studies showed that inside the home was a common place to fall among older adults in an urban community (Assantachai et al., 2002; Lausawatchaikul, 1999; Pasunan et al., 1998; Poomsawat, 2006), fallers in this study often fell outside the home (69.3%) including in front of home, market, and public place. The result was congruent with a previous study and the preliminary study, which showed that most of falls occurred outside the home (65 %) (Jitapunkul et al., 1998). It may be explained that the difference may be affected by environmental factors, daily activities, and characteristics of older adults from each community. Most of older adults in this study were independent, so they often went outside home, such as going to the market and the temple.

In addition, older adults in this community encountered with existing environment hazards in the community including the damaged and obstructed walkway, and the slippery floor at the market. These factors may influence older adults often fell outside the home rather than inside home. Similar to the previous studies, slipping and tripping were identified as the most common causes of fall among community-dwelling older adults (NHESO, 2009; NSO, 2007; Poomsawat, 2006; Lausawatchaikul, 1999).

Similar to previous studies from western countries, this study showed that the fallers had better prevention behaviors than non-fallers did. From focus group discussion, fallers perceived inattention, being hurry, wearing inappropriate footwear as their common risk behaviors (Scott et al., 2001 cited in Lookabaugh-Deur&Esdale, 2004; WHO, 2007; Kitkumhang et al., 2006), however there was no statistical significant difference of behavioral risk factors among fallers and non-fallers in this current study.

Although the qualitative data showed that environment hazards involved in every fall event, including slippery floor, uneven floor, and obstructed way, stepping, and having pets, there was no statistical significant association between fall and other environment hazards, except having pets ($\chi^2 = 4.01$, $P<.05$). This finding was similar to previous studies, it showed that slippery floor and obstructed furniture were related to fall (Pasunan et al., 1998). However, the lack of electricity (Jitapunkul et al., 1998;

Pasunan et al., 1998) and Thai style house (Jitapunkul et al., 1998; Thiamwong, 2001) were not found in an urban community. It could be explained that findings were different from community to community, including: 1) the characteristics of housing; 2) community and public place environment hazards. Uneven and damage walkway throughout the community and slippery floor in the market were also identified as environment hazards that contributed to falls. The finding was similar to a previous study (Kitkumhang et al., 2006) which reported the damage pathway was the main risk factor of fall among Thai older adults in the urban community.

2. The process of model development

A-I-C technique was used to develop the fall prevention model. This technique was useful to guide discussion which consisted of three major steps including 1) Appreciation, 2) Influences, and 3) Control. This technique was conducted to understand the capacity and fall problem perceived by the community and to collaboratively plan to solve the problem. In addition, it helped to increase community awareness about the problem

Appreciation was the process to build the desirable picture by participants. The learning experiences of fall problem in the community and the cause of those falls were discussed among older adults and stakeholders. This step helped participants to understand the existing problem and increases self-awareness among participants. Then, the collaborative identifying the fall risk factor in the community and setting the goal for solving those problems were discussed among participants.

Regarding Influences steps, there was sharing experiences of previous strategies to prevent their falls among participants. Then, evidence based practice of effective fall prevention model was presented to participants by the researcher. This step, participants learned more about fall prevention strategies from people in the community and the new information of effective fall prevention model. The collaborative designing the appropriate components of fall prevention model for their community was conducted in the community. Partner organizations to support the activities were identified by the participants also.

Action plan of fall prevention model was developed in the control step. The components of fall prevention model were conducted and set priority in the action

plan. The obtained fall prevention model was implemented by fall prevention team, which could summarize into 4 steps following:

1) Forming of fall prevention team and building the partnerships of fall prevention model.

The forming team and partnerships establishment was needed for fall prevention model development at the beginning. The community had ability to identify the people who were appropriate to be the fall prevention team. Some criteria were "Who is appropriate person could communicate with older adults in the community?", "Who have willing to help older adults?", and "Who is a person could manage their environment?". "*Find the right man on the right job*" was the strategy to forming the fall prevention team in the community. The distributing responsibility following their skills was also a strategy to reduce sense of burden among fall prevention team in the community.

Fall prevention team in this study categorized into 2 major teams including 1) zone leader team and 2) environment leader team.

1) Zone leader team was set in this study because person to person communication was a method for effective communication in this community. Zone leaders had responsibility to inform all news of the project, taking care their older adults, and visit older adults' home in their zone. All of 9 zone leaders were female and housewife. Three of them were public health volunteers. They were assigned 6-8 responsible older adults who lived nearby their house. All of zone leader was familiar with older adults in the community especially in their home area.

2) Environment leader team consisted of a community leader, an elderly club president, and older adults who had experienced to modify their environment. They were assigned for assessing and managing home hazards and community hazards environment because they had experiences for modifying home and community environment. Moreover, they had capacity to contact and advocate with responsible organization (Dusit district office) for older adults.

Regarding partnerships in the fall prevention model, six organizations were identified as partners in fall prevention model. The 6th public health center, Dusit district office, the Crown Property Bureau, Sukantaram temple, Rachawat market, and

private organization were identified as a partner of health (6th public health center), community environment management (Dusit district office), program activity support (the Crown Property Bureau), and materials (private organization, Sukantaram temple, and Rachawat market).

Fall education was initiated and public policy development to invite partner organizations participating in the fall prevention model. Partners were empowered about fall situation and fall prevention strategies by community people. This activity not only increased awareness of fall among partners but also strengthened relationship between fall prevention team and partners.

2) Capacity building in the community

Capacity building in the community was performed both community level and individual level. Capacity was defined as primarily to training and others process to enhance capacity to manage and control their problem (Chirsman et al., 2002).

Regarding community level, fall prevention team in the community was trained to understand the fall risks factors and fall prevention strategies and enhance some skills for managing fall problem in community following their fall prevention model such as 1) multifactorial fall risk assessment, 2) training fall risk factors and fall prevention knowledge before health education activities, 3) training of exercise to be an exercise leader, 4) training of home and community hazard assessment, 5) training record fall surveillance system, and 6) the connection and collaboration with partnerships.

Individual level aimed to enhance ability of older adults to take care themselves for preventing fall. Health education was a strategy to building capacity of older adults. The multifactorial fall prevention was emphasized in health education including 1) fall risk assessment, 2) fall prevention behaviors, 3) exercise training, 4) vision screening, 5) medication review, 6) home hazards assessment and modification, and 7) the notification of fall and community hazards in the community.

3) Establishment of community fall prevention system

Since there were six components of fall prevention model, each of which was prioritized by the fall prevention team, depending on its significance and difficulty.

Multifactorial fall risk assessment was selected to be the first activity for identifying the risks of fall among older adults and high risk group.

Second activity was fall campaign because it was a strategy to increase awareness of fall among older adults in the community. In addition, it helped inform the project and resources including fall prevention team and fall notification center in the community.

Fall education program was identified as the third activity for improving the knowledge of fall risk factors and fall prevention strategies. It was necessary to motivate behavioral change among older adults. It also increased awareness and participation among older adults from partner organizations.

Forty-five minutes exercise training was conducted at least three times per week and run for 3 months. Moreover, group exercises, included balance and strengthen trainingwas chosen in this community. Group exercise 2 times per week and home exercise daily were preferred by the community. Each fall prevention member monitored exercise activity as planned.There was monitoring and modifying this activity until reach the effective of this exercise and satisfaction among older adults and fall prevention team. Occasional event activities, sharing some foods and drinks, and friendship among older adults in exercise group were used to improve attrition among the older adults.

Home visit for medication review and home hazard management was conducted as the last activity because it needed to collaborate with PHN and taken time to do this activity. The priority depended on available time of public health nurse. It integrated in routine home visit for older adults who are at risk of falls every 6 months by public health nurse.

The support system of fall prevention model for enabling action was classified as surveillance and environment management system

1) Surveillance system was a supportive system to enabling fall prevention action to monitor fall incidences and environment hazard in the community. The

community health center was selected to be the fall notification center. In addition, older adults in the community could notify their fall incidence and community hazards to their zone leader. Moreover, there were developing the surveillance record form and distributing to zone leader team.

2) Environment management system was a supportive system for manage environment hazards both home and community environment. The community hazards assessment was conducted by fall prevention team and summarized those hazards to Dusit district office. There was setting a routine environment hazard assessment and guideline for hazards management. In addition, there was making connection with Sukantaram temple and Rachawat market which were a public place that older adults went frequently. Both of them admired to collaborate as a partnership with fall prevention project which fall prevention team could notify the environment hazard to them directly.

4) Empowerment and sustainable

The community capacity building was a strategy to empower the community to belief their capability for managing fall problem in the community and sustaining their activity.

The forming fall prevention team and training them to have ability to manage fall problem in the community was strategy to empower community at the individual level. The acceptance their ideas and supportive them to organize the activities by themselves was also a strategy to empowerment in this study. Exercise activity was a good example, they were designed and added 3 more activities including 1) breathing exercise with the song (Dung Dog Mai Barn: Like Flowers) for warm up and cool down period of exercise group, 2) hand exercise to improve their health (Eight positions), and 3) ball exercise.

The community participation throughout the study was a strategy to sustain the fall prevention model. The participation could create the sense of ownership among fall prevention team. The present of successful fall prevention model by giving the certificate to fall prevention team, club, and community could make the pride to fall prevention team and community. These strategies as mentioned were leading to the sustainability of the project.

3. Effectiveness of fall prevention model

3.1 Effective of fall prevention implementation

The process evaluation components which suggested by Linnan&Steckler (2002) were used to described the effective of fall prevention model. It consisted of context, reach, dose delivered and dose received, fidelity, implementation of fall prevention model, and recruitment. The discussion was described following:

3.1.1Context

A community-based fall prevention model in this study was developed in an urban community in Bangkok. This model was implemented several activities,as proposed by CDC (2008) including multifactorial risk assessment, education program, group exercise, and fall prevention team meeting. Fall prevention tea adapted existing resources in the community for implementing the fall prevention model. For instance, they adapted PHV's home as a meeting place of fall prevention team, the temple as a place for multifactorial fall risk assessment and fall education program, and group exercise place.

Regarding social environment, a community leader, PHVs, an elderly club president, a neighborhood, and a health professional were key persons to support fall prevention among older adults in the community. This study revealed that elderly club could create the sense of community and sense of belonging and participation among older adults in this community. 80 % of participants were elderly club members, who had worked together and used their own resources for support fall prevention activities.

The relationship among health professional, public health volunteers, and older adults was also significant factors. Public health nurse and PHVs have developed trust and acceptance from older adults in the community because they provided health services to those older adults for a long time. They also were key persons to influence older adults participating in the program. The older adults perceived PHN as a part of their community, who helped them to take care of themselves.

The responsible organizations were significant context which could support the community for preventing fall. This model had several responsible

organizations, which were partners including 6th public health center as a partner of health, Dusit district office as a partner of community environment, The Crown Property Bureau as a partner of environment and exercise activity, Sukantaram temple and Rachawat market as partners of public place environment.

3.1.2 Reach

Although this study was not covering all of older adult's population, the number of participants was higher than community expectation (20%). The attendance rate of multifactorial fall risk assessment was 40.19 percent (41/102) of older adults in the community. It could classify the older adults who were a high risk or low risk in this activity. In addition, the results showed that 19 older adults had high risk of fall and 22 older adults had low risk. However, when categorized the older adult following the modifiable risk, 29 older adults had any poor physical performance and 27 reported using medication that related with fall, and 31 people had any home environment hazards, 22 had low visual acuity. 25 older adults had low prevention behaviors. All of participants had at least one risk factor. However, one older adult who had a high risk of fall was moved out this community. Thus, the total of 40 older adults was the target group of implementation after multifactorial risk assessment. The target group of this model included the high risk group of fall and the older adults who had any modifiable risk of fall aimed to minimize the risks of fall among older adults as much as possible

The fall prevention model covered 72.2 percent of high risk population. The attendance rate of each activity covered the older adults who had risk factors ranged from 64.3 % to 100 %, including 100% in fall campaign and home visit for medication review, 83.3 % in fall education 73.2 % in home visit for home assessment, and64.3 % in exercise activity. However, home visit was strategy to follow up the older adults who did not attend in this study which could reach 100% of participants for education program by providing the leaflet at home and exercise at home by providing exercise handbook. Although there was less participation of exercise activity, there were 4 new comers to participating in exercise group. The limitation of exercise group in this study included the time of exercise in the morning which had limitation for older adult who had working.

3.1.3 Dose Delivered and Dose Received

Community could provide all activity of fall prevention model as planned. Handbook, leaflet, and sticker were distributed to all participants. Home visit was strategy to complete dose delivery for older adults in the community including education and exercise by home visit for distributing education or exercise leaflet and motivate them to participate in the model was conducted covering 100 % participants. Since exercise group was a continuing activity, there were using strategies and modifying activities for recruitment the older adults. For example, setting the date and time regularly and conducting occasional event activity (Songkran festival) after exercise. After modifying activities, the attendance rate increased from 45 percent to 64.28 percent.

Regarding dose received, there was monitoring the exercise activity by using exercise diary record. It distribute diary to older adults for recording their exercise at home, however it was not effective for using in older adults in this community. The zone leader team needed to ask the frequency of home exercise of older adults in their zone every week or every time in exercise groups. In addition, most of older adults reported that they increased self-awareness and caution when they change position or walking, doing exercise and a bit organize their home hazards.

3.1.4 Fidelity

Since this model was the multifactorial intervention aimed to reducing the existing risks for older adults as much as possible, the minimum requirement for older adults consisted of all of older adults should be receive the fall risk assessment yearly and knowing about their risk; Education should be provide to older adults especially their existing risk factors and community risks; Exercise group for older adults who had poor physical performance and extend to all older adults in the community because exercise helped to maintain their physical performance also; Older adults who reported medication use related with fall should be received medication review at least 6 month or changing medication use; Home environment need to assess and recommend for modification to all older adults in the community; and community supportive system in community was required to monitor fall problem and community environment management including surveillance system and environment management system.

Concerning sustainability, it needs the collaboration between community and partnerships. Fall risk assessment and home visit can integrate in the routine work of PHN for health screening yearly. Home visit should include the medication review and home hazards assessment. The community needs to conduct the exercise group by themselves and invite the expert to train the exercise leader or using the exercise program in this study. Fall management system and the partnerships were key success to support this model, however, capacity building of health professional and community should be priority strategies to prevent fall in their community.

3.1.5 Implementation of fall prevention model

After 3 months of implementation, six activities was implementing to participants including 1) multifactorial fall risk assessment, 2) fall campaign, 3) education, 4) exercise, 5) home visit, and 6) fall management system. The components of this model were similar to the evidences-based of an effective fall prevention program (Table 2.1) (AGS, 2001; CDC, 2008; and WHO, 2007). However, there was the difference of key person for responsibility of fall prevention model in the community. Evidence-based fall prevention program was provided by the health professional while the community-based fall prevention model in this study was managed by the community. Health professional was a partnership that supported some activities of this fall prevention model.

Regarding the existing fall prevention interventions among Thai older adults (Assantachai et al., 2002; Jitapunkul et al., 1998; Pallit, 2004; Piphatvanicha, 2006) (Table 2.2), all of previous studies were emphasized at the individual level with two or three components of intervention. Those interventions were provided by PHVs and health professional and they were not concerned about community environment. Whereas this study was the first study which developed fall prevention model based on the community with multifactorial intervention. It also developed the supportive system for fall prevention model in the community.

Multifactorial fall risk assessment was the component for identifying the risk factors and high risk group among older adults in the community. Beside the multifactorial fall risk assessment was provided to the participants, it was integrated in the health screening of older adults which provided by PHN and 6th public health center yearly. Previous studies only assess the fall risk factors at the baseline

(Jitapunkul et al., 1998; Pallit, 2004; Piphatvanicha, 2006). Vision screening which was a component of effective fall prevention (AGS, 2001; CDC, 2008; and WHO, 2007) also add up in the multifactorial fall risk assessment in this study.

Fall campaign was the component of fall prevention model for increasing awareness of fall in the community which was planned to conduct every year by the community. This component was the extra component of evidence based recommendation (AGS, 2001; CDC, 2008; and WHO, 2007) as well as in Thai context (Assantachai et al., 2002; Jitapunkul et al., 1998; Pallit, 2004; Piphatvanicha, 2006). However, it was the component which identified by community. The result showed the effective activity to inform the project and increase awareness in the community. Thus, this study recommended that fall campaign should be added in the fall prevention model in the community.

Health education in this study focused on sharing experiences of fallers and older adults. The multifactorial risks and management strategies included 1) understanding multiple risk factors and their interaction, 2) prevention behaviors, 3) regular visual screening and management, 4) review medication and side effect attention, 5) exercise training for balance and gait improving, and 6) environment assessment and modification. These findings supported health education as a significant component in multifactorial intervention (CDC, 2008; Clemson et al., 2004; Ness, Gurney, & Ice, 2003). Group education was suggested in health education because provide the benefit of social interaction, sharing personal experiences which may reduce anxiety and motivate to change their risk behaviors (CDC, 2008). Similar to previous studies in Thailand, group education was the effective method to improve the perception of fall and fall prevention behaviors (Pallit, 2004; Piphatvanicha, 2006). This study supported that group education session was appropriate for Thai older adults because they could recall their behaviors or environments related to fall and learning experience to preventing fall by themselves among older adults. Moreover, group process education can increase awareness of fall problem among partnerships also.

Exercise was the successful component of fall prevention model. There were two major types of exercise that were proved effectively reduction falls among older adults 1) Combination of specific exercises include strengthening and balance

training, and/ or endurance training, gait training, and aerobic activity, and 2) Tai Chi exercise (CDC, 2008). The community was selected the strengthening and balance training exercise (Barnettet al., 2003) as the method for exercise rather than Tai chi exercise in this community. Although there was proved that Tai chi exercise was effective to reduce falls (Li et al., 2005; Wolf, Coogler, &Xu, 1997) as well as in Thai country (Piphatvanicha, 2006). However, older adults in this community perceived that Tai chi exercise were hard to do and they could not do this exercise. The culture may effect to the selecting type of exercises because Tai chi was Chinese tradition exercise while it may not appropriate with Thai older adults in this community.

Moreover, group exercise was identified as the method to convince the older adults exercise regularly in Thai older adults. The frequency of exercise which was accepted by the community was two times a week for group exercise combined with home exercise daily. Moreover, group exercise have been continuing to do the exercise training for 5 months by the attendance rate still high (80% and over) in each time even though the researcher moved out from community.

Home visit was an effective strategy to assess the medication use and recall side-effect attention. In addition, it also could assess home environment hazards and recommendation. Home visit by PHN and fall prevention team was conducted to review medication use and side effect that related with fall, and assess the environment hazards. The recommendation was provided to older adults and their family. Moreover, there were added up to the routine work for home visit by public health nurses which they will visit at home every 6 months. This study congruent with previous study which showed that home visit strategy with multifactorial fall prevention could reduce the incidence fall and the severity of fall injury (Huang & Acton, 2004). Since the medication review and home hazard assessment were identified as components of effective fall prevention (AGS, 2001; CDC, 2008; and WHO, 2007), this study revealed that home visit was a strategy and practical way to review medication and home hazard assessment. Especially in Thai context, PHN could integrate the medication review and home hazard assessment to routine work.

The developing infrastructure in the community for enabling community action was recommended was strategy for community development and sustainable development (WHO, 2002). There was developing the supportive system for fall

prevention model in this study including: 1) fall notification center and fall surveillance system was a system to monitoring and controlling the fall problem in the community and notifying community hazard environment; and 2) the community environment hazard management was the system to assess the community hazards environment and mange home and community hazards

3.1.6 Recruitment

There were several strategies to recruit people in this model. The strategies of recruitment were described as following:

Fall prevention team was identified and recruited by PHN and PHV who also was an elderly club leader. PHN could identify PHVs who appropriate to be the fall prevention team while PHV could identify elderly club members who had willing to be the fall prevention team. Both of them learned from their experiences that who had willing to participate for helping older adults in the community. Invitation letter and encouraging them to be fall prevention team were conducted by the researcher, PHN, and PHVs. All of people who were identified by PHN and PHV accepted to be fall prevention team.

Person to person communication and home visit were strategies to recruit older adults in the community participating in this model. The effective public relation in this community was person to person communication by visiting at older adults' home. The letter invitation also was a strategy to present the respect and emphasis on older adults involving in the model. In addition, home visit also was a strategy to follow up older adults and encourage them to participate in the fall prevention model. The occasional event was also strategy for recruitment the older adults in fall prevention model such as Songkran Festival Day.

Most partner organizations were identified by the community. Most partners were community networks which they had responsibility related with this community including Dusit district office, Crown Property Bureau, and 6th public health center. The official letter was an effective mean for recruitment these partners participating in this model.

Regarding temple and market which was identified as the common area where fall occurred, the building relationship and introducing the fall prevention team to them were strategies to recruit them in the model. The fall problem among older

adults and fall prevention model were presented to the partners and give emphasis on the participation of these partners in the model for preventing fall among older adults in the community. Private organization was recommended by the researcher for material (canvas shoes) support. Fall prevention project and the picture of fall prevention activities were presented to private organization for asking canvas shoes support.

3.2 Effectiveness of fall prevention model

Effectiveness of model was assessed in terms of incidence of fall reduction, and the fall prevention behaviors and physical performance improvement. This study revealed that the multifactorial was an effective intervention to reduce falls in the community which congruent with evidence-based fall prevention intervention which could reduce the incidence of fall 7-30 percent (Clemson, et al., 2004; Close, et al., 2004; Day et al., 2002; Shumway-cook et al., 2007). Over 10 months follow-up period with 28 participants, there were 2 persons who reported falls incidence, which this study could reduce falls 24.56 percent (pre= 31.7 % VS post= 7.14 %).

In addition, each component of multifactorial could reduce major risk factors by improve the fall prevention behaviors and physical performance. The results in this study showed the mean of prevention behaviors after completed implementation (66.96±4.32) was higher than at baseline (57.57±5.68). In addition, there was statistically significant improve of prevention behaviors after implementation ($t = 8.255$, $P < .001$). This finding supported the effective of health education to improve fall prevention behavior in multifactorial intervention. Although there was evidences support health education was a significant component in multifactorial intervention (CDC, 2008; Clemson et al., 2004; Ness, Gurney, & Ice, 2003), there were few studies that examine the effect of health education and fall behaviors directly. Previous studies showed the effective of health education to improve the perception of fall among older adults which leaded to changing behaviors (Pallit, 2004; Piphatvanicha, 2006)

Wilcoxon Signed Ranks Test was used to examine the improvement of physical performance after completed implementation and complete exercise for 12 weeks. There was statistically significant difference of time to complete FTSS

between baseline and 3 months (Z = 4.517, P <.001). Turn 360 degree was also improved, after 3 months of exercise training the older adults had significant time to complete the turn 360 degree better than at baseline (Z = 3.097, P<.01). Similar to Timed "up&go" showed after 3 months was statistically significant better than at baseline (Z = 4.509, P<.001). In addition, it showed a statistically significant improvement of tandem stand after 3 months of exercise training (P<.05). This finding supported that specific strengthen and balance training exercise was effective to improve the physical performance among older adults which congruent with previous studies adults (Barnett et al., 2003; Campbell et al., 1997; Lord et al., 2003; Rubenstein et al., 2000). Similar to Thai older adults, the previous study showed that there was improvement of balance and gait ability among older adults after Tai chi exercise (Piphatvanicha, 2006). This study revealed that both strengthening and gait training exercise and Tai Chi exercise were effective to improve balance and gait ability among older adults in the community.

However, there was no statistically significant difference after 3 months of exercise training on handgrip strength. It can explain that this exercise may improve lower muscle strength only. Although previous studies showed handgrip strength was the easy instrument to assess the muscle strength and could represent lower muscle strength (knee extension strength and trunk extension strength) (Rantanen, et al., 1994), the result of this study revealed no significant difference of handgrip between before and after implementation.

4. Sustainability of fall prevention model

A community-based fall prevention model aimed to develop the suitable multifactorial intervention in this community context. It will lead to the sustainability of this intervention in the community. The key factors that promoted the sustainability of community work (Chrisman, Senturia, Tang, Gheisar, 2002) were used to describe the sustainability of this model. It was described following:

4.1 Existing team and solid connection: there were forming the fall prevention team and establishing partnership of fall prevention project in this model. All of fall prevention team was the local people in this community. In addition, all partnership of fall prevention project had the sense of partnership and supportive in fall prevention project. Fall prevention team could contact and coordinate with these partnerships by themselves. Partnerships in this model included Dusit district office, Crown Property Bureau, 6th public health center, Sukantaram temple, Rachawat market, and private organizations.

4.2 Using community resources: there was capacity building to the fall prevention team and using community resources in this model. For example, there was training leader team as exercise leaders in exercise activity. Moreover, the materials for using in this model were existing resources in the community including exercise place, chairs, CD-player, etc.

4.3 Outreach: during doing the implementation, there was increasing of fall prevention team and participants. Two people volunteered themselves as a fall prevention team and four new participants attended at exercise activity. In addition, there was planning to inform the fall prevention project aiming to outreach older adults in the community. For example, fall risk assessment and health education were planned to conduct at annually meeting of elderly club in the community. In addition, there was showing some existing activity of fall prevention project such as exercise activity. Fall campaign was planned to conduct every year as well.

4.4 Benefit perception: there was perceived benefits of this project among older adults and fall prevention team both personal benefits and community benefits. Regarding personal benefits, older adults perceived both physical and psychological benefits of this project, especially exercise activity. The personal benefits included healthy, relieve knee pain symptom, improve balance and gait ability. Happiness, less loneliness, and reduce anxiety were reported as psychological benefits among participants. In addition, home visit provided sense of caring and security from health

professional and fall prevention team. Supporting canvas shoes from private organization was also benefit perception among older adults in the community.

Regarding community benefits, the building partnership supporting fall prevention project was the community benefit. In addition, the community had more power to contact with those partnerships. For example, fall prevention team had confidences to notify community hazards to Dusit district office for asking to modify community hazards. In addition, after this project, there was increasing of community leader and resources in the community.

4.5 Celebration of successes: the celebration of successful fall prevention project was conducted before researcher left the community. The certificate from 6th health center and Faculty of Public Health, Mahidol University was given to fall prevention team, community, and elderly club for praising them community as role model to other communities. This activity empowered them to ongoing the project. The award for participant who completed all of activities in the project was also given.

In addition, the experiences for working in this study revealed that teamwork was a significant factor to reduce burden when people working for community, the assigning and distributing responsibility following their skills were keys for sustainability of this project.

Supportive from health professional and organization could promote the sustainability of the project. Some activities should be integrated in the routine work to make sustainable program. Currently, public health nurse at 6th public health center have integrated some activities in the model to their routine work such as 1) fall risk assessment added in the health screening for older adults yearly and 2) Home visit, PHN add up the medication review and home environment assessment in her home visit for older adults in the project which most of them as chronic illness patients.

5. Key successful factors

According to the process of fall prevention model development, there were key successful factors for developing a community-based fall prevention model. It was described following:

5.1 Elderly club leaders were key persons who participated for fall prevention model development and developed fall prevention team in the community. Elderly club president who had a leadership and advocate benefit for their elderly club member as well as elderly club committee which had willing to help older adults in the community and their elderly club members. The strength of elderly club president and committee lead to the successful of the fall prevention model development and forming fall prevention team in the community.

5.2 Elderly club was a key factor or driving force of social movement to advocate benefit for their older adults. This study revealed that elderly club not only created the sense of community among older adults but also advocated and provided the benefit to their members. The strength of elderly club could advocate health screening and field trip for their older adults yearly from responsible organizations and private organizations, for example. The supportive from partner organizations of fall prevention model occurred from the strength of elderly club in the community.

5.3 Community participation was the process which lead to successful and sustainability of fall prevention model**.** Involving community in decision-making throughout the process will lead to using the effective resources, designing appropriate activity, and creative thinking in the community. This study revealed that the community could arrange and apply the existing materials in the community including the areas of meeting and conducting activity, and materials for using each activity. For example, home area of health volunteer applied to be exercise place, and temple in the community was used to conducting risk assessment and education program.

5.4 Fall prevention team was a key factor to recruit older adults in the community participating in fall prevention program. Fall prevention team who lived in the community understood the characteristics of older adults in the community. It could create strategies to approach older adults including communication strategies and recruitment strategies in fall prevention program. Fall prevention team needed to approach each older adult at home and persuade them for participation. This strategy

could present the strong of the team and get the acceptance from older adults, especially in an urban community, Bangkok.

5.5 Public health nurse was a key person for developing fall prevention model in the community. Public health nurse was a health professional who was familiar with the community. Especially public health nurses who had work experiences with the community, they could create the trust and acceptance from people in the community. The convincing the people in the community and provide the appropriate knowledge will lead to community participation for preventing fall among older adults in the community. Moreover, PHN had authority to work with PHVs in the community. Thus, PHN should be aware in fall problem among older adults in the community and using the relevant knowledge to develop fall prevention model in the community. It will lead to the successful of fall prevention model development.

5.6 The researcher who was a catalyst people and acted as an advances public health nurse for community management. Raising awareness of fall problem to community, health professionals, and responsible organizations was required for community participation in fall prevention model. The collaborative with partner organizations and capacity building of community and public health nurse were also key success factors for developing and implementing fall prevention model.

5.7 Funding supportive was also the key successful factor. Beside the funding support from research project, it came from private organization and elderly club. Private organization which had policy to support older adults was an alternative funding support in fall prevention model. In this study, older adults could modify their shoes to canvas shoes because of private organization supportive. Exercise activity in this model was supported by elderly club and elderly club members, for example, place of exercise, materials, food and drink, etc.

5.8 The collaboration of responsible organizations in the community was useful in fall prevention model development. The organizations which emphasized on community participation and had policy for community development will lead to the supportive of those organizations for fall prevention model. In addition, the various authorities of partnerships also lead to the successful of fall prevention model including health authority, local authority, and other local networks. For example in

this study, 6th public health center as a partner of health, the Dusit district office as a partner of community environment, The Crown Property Bureau as a partnership of environment and exercise activity, Sukantaram temple and Rachawat market as partners of public place environment**.**

CHAPTER VI
CONCLUSION

Action research was applied in this study aiming to develop a community-based fall prevention model for Thai older adults in an urban community, Bangkok and examine its effect on older adults. Community participation and PRECEDE-PROCEED framework were applied, which included: 1) situation analysis of the fall, 2) model development, 3) implementation, and 4) model evaluation. Effectiveness of a 10-month community-based fall prevention model was measured in terms of reducing the risks of fall and fall-accident among 28 Thai older adults by increasing fall prevention behaviors and improving physical performance of older adults, and developing supportive systems in the community. This chapter presents in the following parts: 1)A community-based fall prevention model in an urban community, Bangkok; 2) Lesson learned; 3) Limitations; 4) Implications; and 5) Recommendations.

1. A community-based fall prevention model in an urban community, Bangkok

A community-based fall prevention model in an urban community, Bangkok was developed based on community, stakeholders, and partnerships. Older adults, community leaders, elderly club leaders, public health volunteers (PHVs), and public health nurse, were persons who collaborative developing this model. The multi-factorial fall prevention model consisted of six components including: 1) multifactorial fall risk assessment, 2) fall campaign, 3)education, 4) exercise, 5) home visit, and 6) fall management was developed.

The processes for implementing a community-based fall prevention model were described as following. First, forming and developing the fall prevention team in the community and fall campaign were conducted for managing fall problem in the community. In addition, identifying partnerships both public and private organization for supporting the fall prevention model were conducted in the same time. Then, capacity building in the community was performed at both community level and individual level. Regarding community level, fall leader team was volunteers and trained to understand factors and strategies to enhance some skills for managing fall in their community. Health education was used as a strategy to build capacity of older adults at individual level aiming to enhance ability of older adults to take care themselves for preventing falls. The collaborative designing and organizing activities in the model were set and organized by the participants which depending on the significant and difficulty to do each activity. Community support system was developed for enabling action paralleled with other activities.

The community participation throughout implementing this model was a strategy to sustain this model in the community. The participation at the beginning could create the sense of ownership among fall leader team. The developing partnership to support this model and using existing resources in the community, and presenting the successful of fall prevention in the community by giving the certificate to leader team were also leading to the sustainability of this model.

Effectiveness of a community based fall prevention model

This study revealed that the multifactorial was an effective intervention to reduce falls in the community. It was congruent with evidence-based of effective fall prevention program which could reduce the incidence of fall approximately 7-30 percent (Clemson et al, 2004; Close et al, 2004; Day et al, 2002; Shumway-cook et al, 2007). After completed implementation, the overall participants were 28 participants. Over 10 months follow-up period, there were 2 persons who reported falls incidence (pre= 31.7 % VS post= 7.14 %, 24.56 % fewer) which showed 24.56 % reducing of fall incidence.

In addition, each component of multifactorial could reduce major risk factors by improving behaviors and physical performance. The results in this study showed the mean of prevention behaviors after completed implementation

(66.96±4.32) was higher than at baseline (57.57±5.68). In addition, there was statistically significant improve of prevention behaviors after implementation (t = 8.255, P< .001). This finding supported the effective of fall prevention model to improve fall prevention behavior.

Wilcoxon Signed Ranks Test was used to examine the improvement of physical performance after completed implementation for 12 weeks. It showed that the physical performance of participants after implementation was statistically significant better than at baseline including FTSS (Z = 4.517, P <.001), Turn 360 degree (Z = 3.097, P<.01), and Timed “up&go” (Z = 4.509, P<.001).Similar to tandem stand, it showed a statistically significant improvement of tandem stand after 12 weeks of exercise training (P<.05). This finding supported that specific strengthen and balance training exercise was effective to improve the physical performance among older adults which congruent with previous studies adults (Barnett et al, 2003; Campbell et al, 1997; Lord et al, 2003; Rubenstein et al, 2000).

2. Lesson learned

2.1 The understanding community context and building relationship with community until getting the acceptance and trust from the community was necessary to working with the community. The community readiness should be considering before starting work with community also.

2.2 Public health nurses (PHNs) had capacity to work with their responsible community because of their experiences. Public health nurses who had experiences work with the community could get the trust and acceptance from the community. They were key persons for recruitment and encouraging the people in the community participating in the model

2.3 PHVs were key persons for collaborative development the fall prevention model for older adults in the community with PHN. Public health volunteers were governed by PHNs, which they could inform and communicate with the people in the community directly.

2.4 Elderly club was a key function group to facilitate older adults in the community to join the program. Particularly, the chair and the leaders of the elderly club worked as an engine to mobilize fall prevention program in this community. In

addition,it created the sense of community, especially in an urban community. It also had a power for advocate benefit for older adults in the community from both public and private organization as well as local politicians.

2.5 The community involvement started at beginning to collaboratively identify the problem and design the intervention could create the sense of ownership of the program among leader team. In addition, community participation was effectively used to engage people and mobilize their community resources, and to create the sense of ownership among leader team, leading to sustainability development of the program in the community.

2.6 The existing networks and partnership were significant resources for supportive system. This study, partner organizations including local authorities, health authorities, and others organizations were established to strengthen and expand networks for achieving the community goal.

2.7 Community capacity building was essential for improving fall prevention management skills of both individual level and community level. The competency of community people in coordination and collaboration with existing networks and responsible organizations is important for community development. Community development, especially leader team, should be conducted. This study found that it took about three month to train and assist community leaders until they had confidence to manage the activity by themselves.

2.8 Teamwork was a significant component for community health promotion achievement. The activity plans including assigning and distributing responsibility were set and monitored for sustainability of the project.

2.9 Alternative strategies were needed to be concerned to make its appropriate with cultural diversity. This study, some older adults had preferred the balance training exercise rather than Tai Chi exercise because they felt that Tai Chi exercise was very complex and unsecure for them.

3. Limitations

3.1 Generalizability of the recent study was limited due to purposive sampling and action research design. Most participants of this study were independent

older adults, who were active and lived in one urban community, located in Bangkok. Thus, selection bias may be concerned.

3.2 The limitation of fall risk screening (Thai-FRAT) for home environment hazards. In addition, most of fall risks in this study were unmodified factors, except visual acuity and tandem stand, which needed time for improvement. Thus, it may affect number of high risk people.

3.3 Environment modification was limited due to family concerned and limited financial support. For the next study, longer time may be needed for the environment changes follow up.

4. Implications

Nursing administration: Policy formulation to prevent fall among older adults living in an urban community, Bangkok should be concerned. An application of fall prevention model was recommended in health promotion work of public health center under Bangkok Metropolitan Administration (BMA).

Nursing education: capacity building of community management, advocacy skill, social mobilization, collaboration with responsible organizations of the community should be considered for public health nurse education. In addition, short course training for enhancing the competency of public health nurse for community management, partnership and collaboration with existing networks or responsible organization and community is recommended for nursing education.

Nursing practice: the feasibility of application of fall prevention model should expand to other urban communities in Bangkok. Multifactorial fall risk assessment should be integrated in routine of health screening yearly for older adults. While routine home visit for older adults should include medication review and home environment management to identify those with high risk of fall. Strength and balance training is an alternative exercise for older adults in the community.

5. Recommendations

5.1 Policy planning

The policy of safety environment is recommended for older adults. The fall-safe community needs to inform and raise awareness among organizations

especially in Bangkok such as district office, expanding to public place such as market and temple that had responsibility for community environment management. Home environment assessment and modification is a sensitive issue in some communities especially in an urban poor community. The place limitation and economic status is also the barriers to modification. The foundation to support home hazard modification such as toilet or handrail for older adults who had economic problem is recommended.

The health personnel who work for community development should be considered as a new position of human resources structure in public health center. They had responsibility for community development by working together with home visit nurse in that community is recommended.

5.2 Nursing practice

An application fall prevention model was evidenced in this study. Community-based fall prevention intervention will be the effective way for public health nurse to work with the community. Fall prevention among older adults in the community should consider in the community which had a high proportion of older adults or existing of fall problem.

5.3 Nursing education

The workshop of community development and community-based action research for solving community health problem for public health nurse is recommended for nursing education.

5.4 Nursing research

The community-based model is the effective methodology for solving the problem in the community. The development of community-based model in other health problems or other populations is recommended for nursing research.A longitudinal study should be conducted to assess the effect of fall prevention model in other urban communities.

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APPENDICES

Appendix A
Pre-research instrument

1. Community assessment guideline

1.1 ประวัติศาสตร์ชุมชน

1) ประวัติความเป็นมาของชุมชน

2) จำนวนประชากรในชุมชน

3) ศาสนา อาชีพรายได้ การศึกษา

4) เหตุการณ์สำคัญในชุมชนที่ผ่านมามีอะไรบ้าง (การสร้าง โรงเรียน วัด/ ถนน)

5) ความเชื่อของบุคคลในชุมชนมีอะไรบ้าง

6) มีภูมิปัญญา หรือระบบความเชื่อค่านิยมใดบ้าง ที่ทำให้ชุมชนสามารถแก้ปัญหา

1.2 แผนที่เดินดิน

1) ลักษณะภูมิประเทศและเขตติดต่อ

2) สภาพทั่วไปของชุมชนและแผนที่ชุมชน

1.3ผังเครือญาติ

1) โครงสร้างครอบครัวของชุมชน

2) เครือข่ายทางสังคม (Social Network) ที่สนับสนุนแต่ละครอบครัวความสัมพันธ์ระหว่างครอบครัว หรือไม่ อย่างไร โดยเฉพาะผู้สูงอายุกับเครือข่ายทางสังคม

1.4 โครงสร้างองค์กรชุมชน: ผู้นำชุมชนที่เป็นทางการและไม่เป็นทางการ (ผู้นำทางด้านศาสนา ทางวัฒนธรรม ทางด้านภูมิปัญญา) มีใครบ้างคัดเลือกอย่างไร บทบาทหน้าที่เชิงการเมือง เศรษฐกิจ สังคม

1) ความสัมพันธ์ทางเศรษฐกิจ

- อาชีพของคนในชุมชน การแบ่งหน้าที่ และหัวหน้ากลุ่มและเครือข่ายแต่ละอาชีพเป็นอย่างไรบ้าง

- ฐานะทางเศรษฐกิจภายในชุมชนเป็นอย่างไร มีความแตกต่างกันมากน้อยหรือไม่อย่างไร

- คนในชุมชนมีหนี้สินหรือไม่ แหล่งเงินกู้ของชุมชน และเงื่อนไขการชำระ (ข้อมูลจากการสัมภาษณ์)

2) ความสัมพันธ์ทางสังคม

- ในชุมชน มีการจัดตั้งองค์กรหรือกลุ่มทางสังคมต่างๆหรือไม่ (คณะกรรมการชมรม) อย่างไร

- สมาชิกในชุมชนมีความผูกผันกันแบบไหน อย่างไร มีอะไรยึดเหนี่ยว

- การสร้างความสัมพันธ์และการแก้ไขความขัดแย้งของคนภายในชุมชนเป็นอย่างไร ทำอย่างไร

- มีกติกา หรือกฎเกณฑ์ อย่างไร ต่อการจัดความสัมพันธ์ในการจัดสรรหรือใช้ประโยชน์ และการแลกเปลี่ยนในชุมชนอย่างไร

- ในชุมชนมีโครงการใดที่ดำเนินการอยู่หรือไม่

- ในชุมชนมีรูปแบบการแก้ปัญหาของชุมชนอย่างไร

- มีกลุ่มหรือองค์กรอะไรบ้างที่เข้ามาทำงานกับชุมชน รูปแบบและเนื้อหาการทำงานอย่างไร

- แหล่งประโยชน์ภายในชุมชนและภายนอกชุมชนมีอะไรบ้าง มีกองทุนหรือมูลนิธิใดเข้ามาช่วยเหลือหรือไม่(ข้อมูลจากการสัมภาษณ์และแบบบันทึก)

3) ความสัมพันธ์ทางการเมือง

- โครงสร้างการปกครองท้องถิ่นที่เกี่ยวข้องกับชุมชนของท่านมีอะไรบ้าง

- ที่ผ่านมามีหน่วยงานรัฐเข้ามาทำงานกับชาวบ้านด้านใดบ้าง

- เคยมีปัญหาขัดแย้งระหว่างชาวบ้านกับกลไกของภาครัฐหรือไม่ อย่างไร

1.5 ระบบสุขภาพชุมชน

1) ภาวะสุขภาพ (การตาย การป่วย การหกล้มในผู้สูงอายุ)

2) การได้รับบริการสาธารณสุข (สิทธิ/สวัสดิการ) สิทธิผู้สูงอายุ การตรวจร่างกายประจำปี

3) ปัจจัยเสี่ยงด้านพฤติกรรมสุขภาพ ดื่มเหล้า สูบบุหรี่ การใช้ยาเป็นประจำ

4) ท่านคิดว่าผู้สูงอายุเสี่ยงต่อการหกล้มหรือไม่ ภายในชุมชนของท่านมีผู้สูงอายุที่หกล้มบ้างหรือไม่ จำนวนและการบาดเจ็บเป็นอย่างไร

5) ถ้ามีผู้สูงอายุหกล้มมีผลกระทบต่อใครบ้าง อย่างไร

1.6 ปฏิทินชุมชน

1) ประเพณี พิธีกรรม หรือกิจกรรมที่สำคัญ ที่ชุมชนมีกิจกรรมร่วมกันใน 12 เดือน

Appendix B
Situation analysis instruments

1. Screening tools: Chula Mental Test

คำถาม	คำตอบ	การให้คะแนน	คะแนนที่ได้
1. ปีนี้คุณอายุเท่าไร		1/0	
2. ขณะนี้กี่โมง ? (อาจตอบคลาดเคลื่อนได้ 1 ชั่วโมง)		1/0	
3. พูดคำว่า “ร่ม กระทะ ประตู” ให้ฟังช้าๆชัดๆ 2 ครั้งแล้วให้ผู้ที่ถูกทดสอบทวนชื่อทั้งสามดังกล่าวทันที (ชื่อถูก 1 ชื่อ เท่ากับ 1 คะแนน)	“ร่ม”	1/0	
	“กระทะ”	1/0	
	“ประตู”	1/0	
4. เดือนนี้เดือนอะไร		1/0	
5. คนนั้นเป็นใคร (ให้ถามถึงบุคคล 2 คน เช่น แพทย์ พยาบาล หรือถามบุคคลใกล้เคียง	บุคคลที่ 1	1/0	
	บุคคลที่ 2	1/0	
6. ข้าว 1 ถังมีกี่ลิตร/ กี่กิโลกรัม	15 กก.	1/0	
7. ให้ผู้ถูกทดสอบ **ทำตามคำสั่ง** ที่จะบอกต่อไปนี้ “ให้ตบมือสามทีแล้ววกอดอก” (ให้ 1 คะแนน ถ้าทำได้ครบทุกขั้นตอน)		1/0	
8. จงบอกความหมายของสุภาษิตต่อไปนี้ “หนีเสือปะจระเข้”		1/0	
9. บอกผู้ถูกทดสอบว่า จงฟังประโยคต่อไปนี้ให้ดี เมื่อฟังจบแล้วให้พูดตามทันที “ ฉันชอบดอกไม้ เสียงเพลง แต่ไม่ชอบหมา”		1/0	
10. ถามผู้ถูกทดสอบว่า “ถ้าลืมกุญแจบ้านจะทำอย่างไร”		1/0	
11. บอกให้ผู้ทดสอบนับเลขจาก 10-20		1/0	
12. 1. ชี้ไปที่นาฬิกา แล้วถามว่าคืออะไร / เรียกว่าอะไร		1/0	
2. ชี้ไปที่ปากกา แล้วถามว่าคืออะไร / เรียกว่าอะไร		1/0	
13. บอกให้ผู้ถูกทดสอบลบเลขทีละ 3 จาก 20 ทั้งหมด 3 ครั้ง	20-3 = 17 17-3 = 14 14-3 = 11	1/0	

หมายเหตุ คะแนนต่ำสุดคือ 0 และสูงสุดคือ 19

2. Screening tools: Barthel ADLs Index

กิจกรรม	คะแนน
1. การรับประทานอาหาร (Feeding) 0 = ไม่สามารถทำเองได้1 = รับประทานอาหารได้บ้าง แต่ต้องมีคนช่วยตัดและเตรียมอาหาร 2 =รับประทานได้เอง โดยไม่ต้องช่วย	
2. การอาบน้ำ (Bathing) 0 = ไม่สามารถทำเองได้1=ทำได้เอง	
3. ล้างหน้า, แปรงฟัน, หวีผม, โกนหนวด (Grooming) 0 = ไม่สามารถทำเองได้1=ทำเองได้	
4. การสวมใส่เสื้อผ้า (Clothing) 0 = ทำเองไม่ได้เลย1 = ทำเองได้ 50 %ที่เหลือต้องมีคนช่วย 2 =ทำเองได้(ติดกระดุม รูดซิบ)	
5. การกลั้นอุจจาระในระยะ 1 สัปดาห์ที่ผ่านมา (Bowels) 0 = กลั้นไม่ได้1 = กลั้นไม่ได้เป็นบางครั้ง 2 =การขับถ่ายปกติ	
6. การกลั้นปัสสาวะในระยะ 1สัปดาห์ที่ผ่านมา (Bladder) 0 = กลั้นไม่ได้หรือคาสายสวน1 = กลั้นไม่ได้บางครั้ง 2 =กลั้นได้เป็นปกติ	
7. การใช้ห้องน้ำ (Toilet) 0 = ไม่สามารถทำได้1 = ต้องมีคนช่วย แต่สามารถทำความสะอาดเองได้ 2 =ทำเองได้	
8. การเคลื่อนย้ายลุกนั่ง , ลุกจากเตียง (Transfer) 0 = นอนติดเตียงนั่งเองไม่ได้จะล้มใช้คนช่วยพยุงนั่งถึง 2 คน 1 = ต้องช่วยอย่างมากจึงจะนั่งได้เมื่อพยุงขึ้นมานั่งอยู่ได้ 2 =ต้องการความช่วยเหลือบ้าง (บอกให้นั่ง)3 =ทำได้เองลุกจากเตียง-นั่งเก้าอี้	
9. การเดิน (Mobility) 0 = เคลื่อนที่ไปไหนไม่ได้1 = ต้องใช้รถเข็น 2 =เดินโดยมีคนพยุง3 =เดินได้เอง	
10. การขึ้นลงบันได 1ชั้น (Stair) 0 = ไม่สามารถทำได้1 = ต้องการคนช่วย2 =ขึ้นลงได้เอง	
รวม(คะแนนเต็ม 20คะแนน)	

3. Data collection instrument: Fall risk assessment questionnaires and testing

N0. __ __ __

<u>1. ประวัติส่วนบุคคล</u>(Demographic data)

คำชี้แจง ผู้วิจัยจะสัมภาษณ์ข้อมูลจากผู้สูงอายุแล้วขีดเครื่องหมายถูก(✓) ในช่องสี่เหลี่ยม (☐)หรือเติมคำตอบลง ในช่องว่าง (……..)

เลขที่ผู้สูงอายุ.....

ที่อยู่(บ้านเลขที่).....

ส่วนที่ 1 **ข้อมูลส่วนบุคคล**

1.1 วันเกิด (วัน/เดือน/ปี).....อายุ.....ปี

1.2 สถานภาพสมรส

☐โสด ☐คู่ ☐หม้าย, หย่า, แยก

1.3 สถานภาพความเป็นอยู่

☐ อยู่คนเดียว☐ อยู่กับคู่ครอง

☐ อยู่กับบุตรหลาน☐ อยู่กับคู่ครองและบุตรหลาน

☐ อยู่กับญาติ ☐อยู่กับคนอื่น

1.4 ระดับการศึกษา

☐ไม่ได้เรียน ☐ ประถมศึกษา

☐ มัธยมศึกษา ☐ ปริญญาตรี

☐ สูงกว่าปริญญาตรี ☐ อื่นๆ ระบุ.....

1.5 อาชีพ

☐ไม่ได้ทำงาน ☐ ค้าขาย

☐รับจ้าง ☐รับราชการ

☐อื่นๆ ระบุ.....

1.6 รายได้เฉลี่ยต่อเดือน (บาท) ระบุ.....บาท/เดือน

1.7 แหล่งของรายได้ (ระบุได้มากกว่า 1 ข้อ)

☐จากการทำงานของตนเอง ☐ จากบำนาญ

☐คู่สมรส ☐บุตร/หลาน

☐เบี้ยยังชีพ ☐อื่นๆ ระบุ.....

1.8 ความเพียงพอของรายได้

☐ เพียงพอ ☐ไม่เพียงพอ

1.9 สิทธิการรักษา

☐ไม่มีสิทธิการรักษา ☐ข้าราชการ/ต้นสังกัด

☐ประกันสังคม ระบุสถานพยาบาล.....

☐บัตรประกันสุขภาพ ระบุสถานพยาบาล.....

☐ อื่นๆ ระบุ.....

1.10 ท่านมีโรคประจำตัวที่ได้รับการวินิจฉัยจากแพทย์หรือไม่

☐ไม่มี ☐มี ระบุ

☐โรคความดันโลหิตสูง ☐โรคหัวใจ

☐โรคเบาหวาน ☐โรคข้อเข่าเสื่อม ระบุ.....

☐โรคหลอดเลือดสมอง ☐โรคพาร์กินสัน

☐ อื่น ๆระบุ.....

1.11 ประวัติการใช้ยา: ท่านใช้ยาชนิดใดเป็นประจำ (ตอบได้มากกว่า 1 ข้อ)

☐ไม่มี ☐มี ระบุ

☐ยาลดความดันโลหิต ☐ยาขับปัสสาวะ

☐ยานอนหลับ ☐ยาเกี่ยวกับจิตประสาท* ระบุ.....

☐ยาคลายกล้ามเนื้อ ☐ยาลดไขมัน

☐ ยากันชัก ☐กินยามากกว่า 3 ชนิดต่อวัน

☐อื่น ๆระบุ.....

(* ยาต้านการซึมเศร้า ยากล่อมประสาท ยารักษาโรคจิต และยาต้านวิตกกังวล)

1.12 ในระยะ 1เดือนที่ผ่าน ท่านมีอาการเหล่านี้บ่อยแค่ไหน

อาการ	**ความบ่อย (ครั้ง/อาทิตย์)**
1. กลั้นปัสสาวะไม่ได้	
2. สูญเสียการทรงตัวบ่อยครั้ง	
3. หน้ามืด/เวียนศีรษะ	
4. ขาอ่อนแรง	
5. อ่อนเพลีย	
6. นอนไม่หลับ	

ส่วนที่ 2ประวัติการหกล้ม

2.1 ประวัติการหกล้ม: ใน 1 ปีที่ผ่านมาท่านเกิดการหกล้มหรือไม่

หกล้ม หมายถึง การที่ท่านสูญเสียการทรงตัวทำให้อวัยวะส่วนใดส่วนหนึ่งของท่านสัมผัสหรือกระแทกพื้นที่ต่ำกว่าโดยไม่ได้ตั้งใจ ซึ่งอาจทำให้บาดเจ็บหรือไม่ก็ตาม

☐ เคย (ระบุจำนวนครั้งที่หกล้ม) .....ครั้ง

☐ไม่เคย (ข้ามไป ถามส่วนที่ 3)

2.2 กรุณาระบุรายละเอียดของการหกล้มที่ผ่านมา

การหกล้มที่ผ่านมา	**สถานที่ (ล้มที่ไหน)**	**สาเหตุ (เกิดจากอะไร)**	**การบาดเจ็บ (เจ็บตรงไหน)**	**การรักษา (ไปรักษาที่ไหน)**	**ค่าใช้จ่าย (บาท)**
ครั้งที่ 1 **ระบุวันที่**					
ครั้งที่2 **ระบุวันที่**					
ครั้งที่ 3 **ระบุวันที่**					

หมายเหตุ แนวทางการระบุละเอียดของการหกล้ม

สถานที่ ภายในตัวบ้าน ระบุสถานที่.....

ภายนอกตัวบ้าน: ภายในชุมชน ระบุระบุสถานที่ .....

ภายนอกชุมชน ระบุระบุสถานที่ .....

สาเหตุ ลื่น สะดุดสิ่งกีดขวาง

พื้นต่างระดับ ตกบันได

หน้ามืด อื่น ๆ (ระบุ)……

การบาดเจ็บ ระบุการบาดเจ็บที่ได้รับ**.....**

การรักษา นอนพักรักษาโรงพยาบาลนาน.....วัน รับการรักษาที่แผนกฉุกเฉิน

รักษาเอง ไม่ต้องรักษาเลย

ค่าใช้จ่าย ระบุค่าใช้จ่ายเป็นจำนวนเงินบาท……

2. แบบประเมินความเสี่ยงต่อการหกล้ม(The Thai Falls Risk assessmen test)(Thiamwong et al, 2008)

แบบประเมินความเสี่ยงต่อการหกล้ม (Thai-FRAT)				
ปัจจัยเสี่ยง	**เกณฑ์**	**ระบุปัจจัยเสี่ยง**	**คะแนน**	**ผู้ประเมิน**
เพศหญิง	-	☐ หญิง (เสี่ยง) ☐ชาย	1	
การมองเห็น (VA Test)	ไม่สามารถอ่านตัวเลขที่ระยะ 6/12 ได้เกินครึ่ง (Snellen Chart)	VA = ☐< 6/12 (เสี่ยง) ☐> 6/12	1	
การทรงตัว	ยืนต่อเท้าในแนวเส้นตรงไม่ได้ หรือยืนได้ไม่ถึง10 วินาที	Full Tandem test ☐ ไม่ได้ (เสี่ยง) ☐ได้…….นาที	2	
การใช้ยา	กินยาต่อไปนี้ หรือ กินยาตั้งแต่ 4 ชนิดขึ้นไป	☐ยานอนหลับ ☐ยากล่อมประสาท ☐ยาลดความดันโลหิต ☐ยาขับปัสสาวะ ☐กินยามากกว่า 4 ชนิด	1	
ประวัติหกล้ม	มีประวัติหกล้ม ตั้งแต่ 2 ครั้ง ภายใน 6 เดือนที่ผ่านมา	☐มี (เสี่ยง) ☐ไม่มี	5	
บ้านทรงไทย	มีบ้านยกพื้นสูงตั้งแต่ 1.5 เมตรขึ้นไป (บ้าน 2 ชั้น)	☐มี (เสี่ยง) ☐ไม่มี	1	
		คะแนนรวม	11	

<u>3.แบบสัมภาษณ์พฤติกรรมในการป้องกันการหกล้มของผู้สูงอายุ</u>(The fall protective behaviors questionnaire)

คำชี้แจง:ให้ท่านฟังคำถาม แล้วเลือกคำตอบที่ใกล้เคียงกับการปฏิบัติตัวของท่านมากที่สุดเพียงคำตอบเดียว แต่ละข้อมี 4 ตัวเลือกดังนี้

ปฏิบัติเป็นประจำ	หมายถึง ท่านปฏิบัติตามข้อความนี้เป็นประจำ สม่ำเสมอ
ปฏิบัติบ่อยครั้ง	หมายถึง ท่านปฏิบัติตามข้อความนี้บ่อยครั้ง แต่ไม่สม่ำเสมอ
ปฏิบัติบางครั้ง/นานๆครั้ง	หมายถึง ท่านปฏิบัติตามข้อความนี้เป็นบางครั้ง
ไม่เคยปฏิบัติเลย	หมายถึง ท่านไม่เคยปฏิบัติตามข้อความนี้ทั้งหมด

พฤติกรรมการป้องกันการหกล้ม	ความถี่ในการปฏิบัติ			
	เป็นประจำ	บ่อยครั้ง	บางครั้ง/นานๆครั้ง	ไม่ปฏิบัติเลย
1 ท่านระมัดระวังในการลุกนั่ง หลีกเลี่ยงหรือระมัดระวังในการเดินผ่านบริเวณที่ลื่น พื้นที่ต่างระดับ และ การขึ้นลงบันได				
2 ท่านมีการเปลี่ยนท่าต่างๆ การลุกนั่ง การลุกยืน อย่างช้าๆ และถูกวิธีด้วยความมั่นใจไม่รีบเร่ง				
3 ท่านใช้ที่ยึดเกาะกับสิ่งพยุงที่มั่นคงขณะเอื้อมมือ หรือก้มลง				
4ท่านใช้เครื่องช่วยเดินได้อย่างถูกต้อง เมื่อท่านต้องการใช้				
5 ท่านดูแลอุปกรณ์ที่ใช้ให้ปลอดภัยต่อการใช้งานมียางกันลื่น				
6 ท่านสวมรองเท้าที่พอดีกับเท้าของท่าน				
7 ท่านสวมรองเท้าส้นเตี้ย				
8 พื้นรองเท้ามีที่ยึดเกาะพื้นได้ดี				
9 ท่านสวมเสื้อผ้าที่พอดีตัว ไม่รุ่มร่ามหรือขากางเกงยาวลากพื้น				
10 ท่านไปตรวจวัดสายตาสม่ำเสมอและรับการรักษาเมื่อมีปัญหา				

พฤติกรรมการป้องกันการหกล้ม	ความถี่ในการปฏิบัติ			
	เป็นประจำ	บ่อยครั้ง	บางครั้ง/นานๆครั้ง	ไม่ปฏิบัติเลย
11 ท่านปรึกษาแพทย์ทุกครั้งเมื่อมีปัญหาเรื่องการรับประทานยาหรือผลข้างเคียงของยา เช่น เวียนศีรษะ หน้ามืด ฯลฯ				
12 ท่านซื้อยารับประทานเองเช่น ยานอนหลับ				
13 ท่านออกกำลังกายอย่างน้อยวันละ 30 นาที				
14ท่านออกกำลังกายที่เพิ่มความแข็งแรงของกล้ามเนื้อ การเพิ่มความสามารถในการทรงตัว เช่น การออกกำลังแบบไทชิ เป็นต้น				
15 ท่านดูแลให้พื้นห้องน้ำของท่านแห้ง/ แยกส่วนเปียกส่วนแห้ง				
16 ท่านดูแลจัดของในบ้านให้เป็นระเบียบ ไม่กีดขวางทางเดิน				
17 ท่านดูแลสายไฟต่อพ่วง ไม่เกะกะทางเดิน เสี่ยงต่อการสะดุดล้มได้ง่าย				
18ท่านดูแลแสงสว่างให้ท่านมองเห็นทางเดิน บันได ได้ชัดเจน				
19 ท่านวางของใช้ของท่านที่ใช้เป็นประจำ ให้สามารถหยิบใช้ได้ง่าย ไม่ต้องเอื้อมหยิบของจากที่สูง				
20ท่านดูแลและจัดเตรียมอุปกรณ์ต่างๆเพื่ออำนวยความสะดวกในการลุกนั่ง เช่น ราวจับ เก้าอี้ อื่นๆ				

4.แบบสัมภาษณ์สิ่งแวดล้อมที่เสี่ยงต่อการหกล้ม (The physical environment hazard assessment)

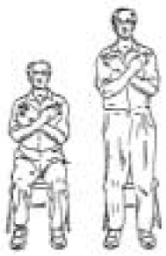
สภาพแวดล้อมของผู้สูงอายุ		ระบุสถานที่
บริเวณทั่วไปภายในบ้าน		
1. **ลักษณะบ้านของผู้สูงอายุ** (ขึ้นลงบันไดทุกวันหรือไม่)	☐ บ้านชั้นเดียว☐ บ้านสองชั้น	
2. **ทางเข้าบ้าน**	☐ไม่มีธรณีประตู☐ มีธรณีประตู	
3. **พื้นต่างระดับภายในบ้าน**	☐ ไม่มี☐ มี	
4. **ลักษณะพื้นบ้าน**	☐ ลื่น☐ ไม่ลื่น	ระบุวัสดุที่ใช้ปูพื้นบ้าน
5. **การวางสิ่งของภายในบ้าน (สิ่งของ สายไฟ ฯ)**	☐ จัดวางของเป็นระเบียบไม่กีดขวางทางเดิน ☐จัดวางของไม่เป็นระเบียบ กีดขวางทางเดิน	
6. **การจัดวางของที่ใช้เป็นประจำ (ทุกวัน)**	☐ สามารถหยิบได้ง่ายไม่ต้องเอื้อมหยิบ ☐ วางไว้บนที่สูง ต้องเอื้อมหยิบของเมื่อต้องการใช้	
7. **แสงสว่างภายในบ้าน (ภายในบ้าน บันได ทางเดิน ห้องน้ำ)**	☐ แสงสว่างเพียงพอ สามารถมองเห็นทางเดิน และสิ่งของได้ชัดเจน ☐ แสงสว่างไม่เพียงพอทำให้มองเห็นทางเดิน และสิ่งของได้ไม่ชัดเจน	
8. **สัตว์เลี้ยงภายในบ้าน**	☐ มี☐ ไม่มี	
ห้องน้ำ		
9. **ลักษณะพื้นห้องน้ำ**	☐ ลื่น ☐ ไม่ลื่น	ระบุวัสดุพื้นห้องน้ำ
10. **การดูแลห้องน้ำ (พื้นห้องน้ำท่านเป็นอย่างไร)**	☐เปียก ☐ แห้งตลอดเวลา	

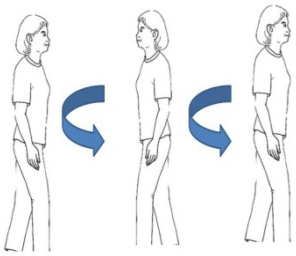
11. **ราวจับภายในห้องน้ำ**	☐ มีราวจับ ☐ ไม่มีราวจับ	
12. **ลักษณะโถส้วม**	☐ ชักโครก ☐ นั่งยองๆ	
13. **ผ้าเช็ดเท้าหน้าห้องน้ำ**	☐ มี ☐ ไม่มี	
บันได		
14. **สภาพบันได**	☐ชำรุด ☐ ไม่ชำรุด	
15. **ราวจับบันได**	☐ มี ☐ ไม่มี	
16. **ลักษณะ ขั้นบันได**	☐สม่ำเสมอ ☐ ไม่สม่ำเสมอ	
สิ่งแวดล้อมเหล่านี้ในชุมชน		
17. **พื้นหรือบันไดชำรุด**	☐ ไม่มี ☐ มี(ระบุสถานที่)	
18. **บันไดไม่มีราวจับ (ระบุสถานที่)**	☐ ไม่มี ☐ มี(ระบุสถานที่)	
19. **ขั้นบันไดไม่สม่ำเสมอ**	☐ ไม่มี ☐ มี(ระบุสถานที่)	
20. **แสงสว่างไม่เพียงพอ**	☐ ไม่มี ☐ มี(ระบุสถานที่)	
21. **มีสิ่งกีดขวางทางเดิน**	☐ ไม่มี ☐ มี(ระบุสถานที่)	
22. **ท่านสังเกตเห็นสิ่งแวดล้อมในชุมชนที่เสี่ยงต่อการหกล้มของท่าน**	☐ ไม่มี ☐ มี(ระบุสถานที่)	

5.แบบบันทึกการประเมินสมรรถภาพทางกาย(Physical Performance)

ตารางบันทึกและเกณฑ์การทดสอบสมรรถภาพทางกาย		
การทดสอบ	**คะแนนที่ได้**	**เกณฑ์**
1. Handgrip Strength	ครั้งที่ 1.....กิโลกรัม ครั้งที่2.....กิโลกรัม รวม.....กิโลกรัม	> 18 **กก.** = **ปกติ** ≤ 18 **กก.** = **เสี่ยง**
2. Full Tandem Stand ยืนต่อเท้าในแนวเส้นตรง	☐ ไม่ได้ ☐ได้**……**นาที	≥ 10 วินาที= **ปกติ** < 10 **วินาที** = **เสี่ยง**
3. 5 times-Chair Stand	เวลาที่ใช้.....วินาที	< 14 **วินาที** = **ปกติ** ≥ 14 **วินาที** = **เสี่ยง**
4. Turn 360 degree	ครั้งที่ 1.....วินาที ครั้งที่ 2.....วินาที รวม.....วินาที	≤ 3.8 **วินาที** = **ปกติ** > 3.8 **วินาที** = **เสี่ยง**
5. Timed “Up & Go” Test	เวลาที่ใช้.....วินาที	≤ **12วินาที**= **ปกติ** >**12 วินาที** = **เสี่ยง**

วิธีการทดสอบสมมรรถภาพทางกาย

การทดสอบ	เครื่องมือและวิธีการ
การประเมินความแข็งแรงของกล้ามเนื้อส่วนบน 	**เครื่องมือ** Handgrip Strength Dynamometer **วิธีการ** 1. จัดระดับที่จับของเครื่องมือให้เหมาะสมกับมือของผู้เข้าร่วมวิจัย 2. ให้ผู้เข้าร่วมนั่งวางแขนบนโต๊ะแล้วใช้มือข้างที่ถนัดกำที่จับ โดยไม่ให้มีการเคลื่อนไหวของลำตัว 3. กระตุ้นให้ออกแรงบีบให้แรงที่สุด **การบันทึก** บันทึกผลการวัดเป็นกิโลกรัม
การประเมินการทรงตัว Full Tandem Stand 	**เครื่องมือ** นาฬิกาจับเวลา **วิธีการวัด** ให้ผู้สูงอายุยืนต่อเท้าในแนวเส้นตรง ควรระวังอุบัติเหตุให้ผู้สูงอายุขณะที่ทำการทดสอบ **การบันทึก** หากผู้สูงอายุไม่สามารถยืนได้ถึง 10 วินาที แปลว่า ทำไม่ได้
การประเมินความแข็งแรงของกล้ามเนื้อส่วนล่าง 5 Times Chair Stand 	**เครื่องมือ** นาฬิกาจับเวลา, เก้าอี้มีพนักพิง **วิธีการ** 1. วางเก้าอี้ชิดฝาผนัง หรือยึดติด เพื่อป้องกันการเลื่อน 2. ท่าเริ่มทดสอบ โดยนั่งตรงกลางเก้าอี้ หลังตรง เท้าทั้งสองอยู่บนพื้น มือทั้งสองกอดอก 3. ลุกขึ้นยืนตรง แล้วนั่งลงทันที ลุก-นั่ง ให้ได้ 5 ครั้ง 4. จับเวลาตั้งแต่ผู้วิจัยสั่งให้ “เริ่ม” จนผู้เข้าร่วมวิจัยนั่งบนเก้าอี้เรียบร้อยในครั้งที่ 5 **การบันทึก** บันทึกผลเป็นเวลาที่ใช้ในการทดสอบเป็นวินาที

การทดสอบ	เครื่องมือและวิธีการ
การประเมินการทรงตัว Turn 360 degree 	**เครื่องมือ** นาฬิกาจับเวลา **วิธีการ** 1. บอกให้ผู้เข้าร่วมวิจัยหมุนตัวเป็นวงกลมในทิศทางที่ตนเองถนัด 2. จับเวลาตั้งแต่ผู้วิจัยสั่งให้ “เริ่ม” จนหน้าและเท้าสองข้างของผู้เข้าร่วมวิจัยกลับมาตรงที่เดิม **การบันทึก** บันทึกผลเป็นเวลาที่ใช้ในการทดสอบเป็นวินาที
เครื่องมือประเมินการทรงตัวและการเดิน Timed Up & Go Test 	**เครื่องมือ** นาฬิกาจับเวลา, เก้าอี้, เทปวัดระยะทาง **วิธีการ** 1. ให้ผู้เข้าร่วมวิจัยนั่งลงบนเก้าอี้ที่จัดเตรียมไว้ 2. ให้ผู้ร่วมวิจัยลุกขึ้นยืนจากเก้าอี้แล้วเดินเป็นระยะทาง 3 เมตร เดินอ้อมจุดที่กำหนดแล้วเดินกับมาที่เก้าอี้และนั่งลงอีกครั้ง โดยให้ผู้เข้าร่วมวิจัยเดินตามปกติ ห้ามวิ่ง หรือเดินเร็ว 3. จับเวลาตั้งแต่จับเวลาตั้งแต่ผู้วิจัยสั่งให้ “เริ่ม” จนถึงผู้เข้าร่วมวิจัยกลับมานั่งที่เก้าอี้ **การบันทึก** บันทึกผลเป็นเวลาที่ใช้ในการทดสอบเป็นวินาที

6. Focus group guidelines: Fall risk assessment and management

<u>แนวทางคำถามในการสนทนากลุ่มเพื่อหาปัจจัยเสี่ยงต่อการหกล้มและแนวทางการป้องกัน</u>

วัตถุประสงค์

1. เพื่อรวบรวมข้อมูลสำหรับค้นหาปัจจัยเสี่ยงต่อการหกล้มของผู้สูงอายุในชุมชน และกลยุทธ์ในการจัดการ

กลุ่มตัวอย่างแบ่งเป็น 2 กลุ่ม กลุ่มละ 8-10 คน

1. ผู้สูงอายุที่อาศัยในชุมชนที่มีประวัติในหกล้มในชุมชน 11 คน
2. ผู้มีส่วนได้ส่วนเสียซึ่งประกอบด้วยแกนนำชุมชนออาสาสมัครสาธารณสุข และชมรมผู้สูงอายุ 8 คน และ พยาบาลสาธารณสุขที่รับผิดชอบชุมชน 1 คน

<u>แนวทางคำถาม</u>

1. ความคิดเห็นเกี่ยวกับการหกล้มในผู้สูงอายุ
   - ท่านคิดว่าผู้สูงอายุมีความเสี่ยงสูงต่อการหกล้มหรือไม่ มีหรือไม่มีอย่างไร
   - ท่านคิดว่าอะไรเป็นสาเหตุที่ทำให้ผู้สูงอายุโดยทั่วไปหกล้ม
2. ปรากฏการณ์การหกล้มของผู้สูงอายุในชุมชน
   - ท่านเคยหกล้มหรือไม่ ถ้าเคย....
   - หกล้มเมื่อไร
   - หกล้มที่ไหน
   - หกล้มได้อย่างไร
   - กิจกรรมที่ทำก่อนการหกล้ม
   - การบาดเจ็บที่ได้รับ
3. สาเหตุที่ทำให้ท่านหกล้ม
   - ท่านคิดว่าอะไรที่ทำให้ผู้สูงอายุหกล้มมีอะไรบ้าง
   - ท่านคิดว่าอะไรที่ส่งเสริมให้ท่านหกล้ม (ผู้สูงอายุในครอบครัว/ชุมชนของท่าน) มีอะไรบ้าง

คำถามเจาะลึก:ปัจจัยส่วนบุคคลและพฤติกรรม

-ท่านมีความรู้เกี่ยวกับการป้องกันการหกล้มหรือไม่ อย่างไร

- ท่านคิดว่าสายตามีผลทำให้ท่านหกล้มได้หรือไม่อย่างไร
- ท่านคิดว่าการใช้ยามีผลทำให้ท่านหกล้มได้หรือไม่อย่างไร
- ท่านคิดว่าสมรรถภาพทางการ เช่น ขาอ่อนแรง สูญเสียการทรงตัว มีผลทำให้ท่านหกล้มได้หรือไม่อย่างไร

- ท่านคิดว่าคนที่ไม่ได้ออกกำลังกายจะหกล้มง่ายกว่าคนที่ออกกำลังกายเป็นประจำหรือไม่อย่างไร

คำถามเจาะลึก: สิ่งแวดล้อม

- ท่านคิดว่าสิ่งแวดล้อมแบบใดที่ทำให้ท่าน(ผู้สูงอายุในครอบครัว/ชุมชนของท่าน) หกล้มอย่างไร

- สถานที่ใดบ้างในบ้านหนือในชุมชนของท่านที่ทำให้ท่าน (ผู้สูงอายุในครอบครัว/ชุมชนของท่าน) หกล้ม อย่างไร

4. การป้องกันการหกล้ม

- ท่านคิดว่าการหกล้มในผู้สูงอายุสามารถป้องกันได้หรือไม่

- ท่านคิดว่าเราจะสามารถป้องกันการหกล้มเหล่านี้ได้อย่างไร

คำถามเจาะลึก:

-ท่านคิดว่าการมีความรู้เกี่ยวกับการป้องกันการหกล้มจะช่วยป้องกันการหกล้มได้หรือไม่อย่างไร

- ท่านคิดว่าการตรวจสายตาอย่างสม่ำเสมอและรักษาเมื่อผิดปกติจะช่วยป้องกันการหกล้มได้หรือไม่ อย่างไร

- ท่านคิดว่าหากท่านได้รับการดูแลในการใช้ยาและให้คำปรึกษาจะช่วยป้องกันการหกล้มได้หรือไม่ อย่างไร

- ท่านคิดว่าการมีออกกำลังกายจะช่วยป้องกันการหกล้มได้หรือไม่ อย่างไร การออกกำลังกายชนิดใด จะช่วยป้องกันการหกล้มได้

- ท่านคิดว่าเราควรปรับสิ่งแวดล้อมจะช่วยป้องกันการหกล้มได้หรือไม่ อย่างไรทั้งในบ้านและชุมชน

- ท่านคิดว่าควรทำอย่างไรเพื่อป้องกันการหกล้มของตนและผู้สูงอายุในชุมชน

5. สิ่งสนับสนุนในการป้องกันการหกล้มในชุมชน

- ใครที่จะสามารถช่วยเราในการป้องกันการหกล้มในบ้านและในชุมชนของท่าน

- แหล่งสนับสนุนใดที่จะสามารถช่วยเราในการป้องกันการหกล้มในบ้านและในชุมชนของท่าน

Appendix C
Model development instruments

1. แนวทางคำถามในการประชุมเพื่อวางแผนเชิงสร้างสรรค์ (A-I-C techniques) เพื่อพัฒนารูปแบบการป้องกันการหกล้ม

1. สร้างภาพชุมชนในฝัน (The Ideal vision)

2.1 สิ่งที่ท่านต้องการเห็นในชุมชนของท่านเกี่ยวกับการหกล้มของผู้สูงอายุ (เป็นชุมชนที่ปราศจากการหกล้ม)

2. I1: หารูปแบบในการแก้ปัญหา (Solution Design)

2.1 ทำอย่างไรชุมชนเราถึงจะไม่เกิดการหกล้ม

2.2 ทำอย่างไรเราถึงจะป้องกันการหกล้มของผู้สงอายุในชุมชนได้

2.3 ถ้าเราต้องการป้องกันการหกล้มแล้ว เราจะต้องมีรูปแบบในการป้องกันอย่างไร สิ่งใดที่เราต้องการให้มีเพื่อป้องกันการหกล้ม (การรายงาน การเฝ้าระวัง การตั้งกลุ่มคนช่วยดูแลหรือช่วยคนที่มีปัญหา)

2.4 แลกเปลี่ยนความรู้เกี่ยวกับรูปแบบที่มีในต่างประเทศ

- การประเมินการหกล้มของคนในชุมชนทุกปี
- การให้ความรู้แก่ผู้สูงอายุในชุมชน
- การตรวจสายตาทุกปี
- การตรวจทานและจัดการกับยาที่มีผลต่อการหกล้ม
- การออกกำลังกายที่เพิ่มสมรรถภาพทางกายที่มีผลต่อการหกล้ม
- การประเมินสิ่งแวดล้มที่เป็นอันตรายและการจัดการกับสิ่งแวดล้อมเหล่านั้น

2.5 กลยุทธ์ใดหรือทำอย่างไรในการที่ชุมชนจะพัฒนาให้เกิดสิ่งเหล่านี้ในชุมชนของท่าน

- การให้ความรู้กับบุคคลใดบ้าง และให้ทางใด (สื่อการสอน แผ่นพับ เสียงตามสาย)
- การออกนโยบายใดที่จะช่วยป้องกันการหกล้ม หรือเกิดรูปแบบต่างๆเพื่อป้องกันการหกล้มได้บ้าง
- แหล่งใดที่จะมาช่วยสนับสนุนให้เกิดสิ่งเหล่านี้ (คนที่จะมาช่วยเหลือ อุปกรณ์ สถานที่ในการจัดกิจกรรม การบริการทางด้านสุขภาพ อื่นๆ)

2.6 ทรัพยากรใดที่ชุมชนมีอยู่และสามารถช่วยในการสนับสนุนให้เกิดกิจกรรมต่างๆ (คนใด แหล่งสนับสนุนทางด้านเงิน การบริการทางด้านสุขภาพ อื่นๆ)

2.7 ทรัพยากรใดที่ชุมชนมีอยู่ และองค์กรใดที่จะมาร่วมมือในการพัฒนารูปแบบนี้

3. I2: จัดลำดับความสำคัญ (Prioritization)

3.1 จากทรัพยากรที่มีอยู่และหาได้กิจกรรมใดที่สามารถทำได้ในชุมชนของเรา

3.2 กิจกรรมใดที่ต้องทำก่อนหรือหลัง

4. C1: สร้างแผนปฏิบัติการ (Action Plan)

4.1 เป้าหมายและวัตถุประสงค์ของโปรแกรมที่จะพัฒนาในชุมชน

4.2 เป้าหมายระยะสั้นและเป้าหมายระยะยาว

4.3 กิจกรรมที่ต้องทำให้บรรลุวัตถุประสงค์

4. 4 ลำดับของกิจกรรมที่ต้องทำก่อนหลังในแต่ละวัตถุประสงค์

5. C2: (Responsibility)

5.1 ใครที่จะเข้ามาเกี่ยวข้องและรับผิดชอบในแต่ละกิจกรรมของโปรแกรมที่จะพัฒนาในชุมชน

5.2 กิจกรรมของแต่ละคนที่จะต้องรับผิดชอบ

5.3 สถานที่ที่ใดที่จะใช้ในการจัดกิจกรรมต่างๆ

5.4 ระยะเวลาของโปรแกรมที่จะพัฒนา

5.5 แผนตารางเวลาและช่วงเวลาของแต่ละกิจกรรมของโปรแกรม

Appendix D
Model evaluation instruments:

1. Partnership Checklist

<u>คำชี้แจง</u> ให้ท่านแสดงความคิดเห็นต่อการมีส่วนร่วมในการพัฒนารูปแบบการป้องกันการหกล้มที่ใกล้เคียงกับความคิดเห็นของท่านมากที่สุด

	0	1	2	3	4	
	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง	
1. **ความต้องการการมีส่วนร่วม**						
- ในการแก้ปัญหาการหกล้มของผู้สูงอายุในชุมชนต้องการความร่วมมือของคนในชุมชนและองค์กรต่างๆ เพื่อแก้ไขปัญหาที่เกิดขึ้น						
-ความร่วมมือของคนในชุมชนและองค์กรต่างๆ ในการป้องกันการหกล้มของผู้สูงอายุในชุมชน จะช่วยให้การป้องกันดังกล่าว เกิดประโยชน์สูงสุดต่อผู้สูงอายุ ปองกันหารหกล้ม และมั่นคงถาวร						
- ท่านได้มีการแลกเปลี่ยนความเข้าใจ,ข้อตกลงของเป้าหมายร่วมกันระหว่างบุคคลและองค์กรที่มีส่วนร่วมในครั้งนี้						
- บุคคลที่มีส่วนร่วมทุกคนมีความเต็มใจในการที่จะแลกเปลี่ยนความคิด แหล่งสนับสนุนต่างๆทั้งทางบวกและทางเพื่อให้ไปถึงเป้าหมายที่ตั้งไว้						
- ท่านคิดว่าการร่วมมือครั้งนี้ได้ประโยชน์ในการพัฒนาชุมชนของท่านโดยไม่รู้สึกว่าเสียเวลาในการให้ความร่วมมือ						รวม
รวม						
2. **การเลือกผู้มีส่วนร่วม**						

	0	1	2	3	4	
	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง	
- เครือข่ายทุกคนได้แลกเปลี่ยนความคิดเห็น สิ่งที่เป็นประโยชน์ และวิธีการช่วยเหลือ						
- เครือข่ายทุกคนเห็นถึงหน้าที่หลักของตนและการพึ่งพาซึ่งกันและกันระหว่างเครือข่าย						
- เครือข่ายมีสัมพันธภาพที่ดีต่อกัน						
- การร่วมมือกันในครั้งนี้ ทำให้เกิดผลประโยชน์ที่ดีต่อเครือข่ายนั้นๆทั้งในระดับบุคคลและชุมชน เช่น ได้รับการเป็นบุคคลตัวอย่างหรือชุมชนตัวอย่าง องค์กรตัวอย่างในการสนับสนุน						
- เครือข่ายที่มี มาจากหลายหน่วยงานที่มีความหลากหลาย ครอบคลุมในการเข้าใจปัญหาและสามารถแก้ปัญหาที่สนใจได้						รวม
รวม						
3. **ความมั่นใจในการมีประสิทธิภาพของเครือข่าย**						
- หัวหน้าในแต่ละองค์กรให้การสนับสนุนในการมีส่วนร่วมครั้งนี้						
- แต่ละเครือข่ายมีศักยภาพและทักษะในการร่วมกันทำงาน						
- เครือข่ายมีกลยุทธ์ในการทำงานเพื่อเพิ่มทักษะและการเพิ่มสมาชิกเพื่อพัฒนางานที่ต้องทำ						
- มีการกำหนด บทบาท หน้าที่รับผิดชอบและเป้าหมายของเครือข่ายที่ควรจะเป็นอย่างชัดเจนและทุกคนในทีมมีเข้าใจในทิศทางเดียวกัน						
- การบริหารจัดการ การสื่อสารและโครงสร้างในการตัดสินใจของเครือข่ายเป็นแบบเรียบง่ายสามารถปฏิบัติได้จริง						รวม
รวม						
4. **การวางแผนในการร่วมกันทำงาน**						
- เครือข่ายทั้งหมดมีส่วนร่วมในการวางแผนและจัดลำดับความสำคัญในการร่วมกันทำงาน						

	0	1	2	3	4	
	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง	
- เครือข่ายมีบทบาทในการสื่อสารและส่งเสริมความร่วมมือในหน่วยงานของตน						
- เครือข่ายบางส่วนมีบทบาทในการติดต่อข้ามสายงานที่เคยมีอยู่ระหว่างตัวแทนต่างๆที่มามีส่วนร่วมในกิจกรรม						
- มีการแบ่งหน้าที่ความรับผิดชอบในการสื่อสาร บทบาทและสิ่งคาดหวังของเครือข่ายที่ควรจะเป็นทั้งหมดอย่างชัดเจน						
- มีระบบในการร่วมกันในการตัดสินใจของเครือข่ายซึ่งสามารถอธิบายได้ สามารถโต้ตอบได้ และครอบคลุม						**รวม**
รวม						
5. **การร่วมกันในการปฏิบัติตามแผนปฏิบัติการ**						
- กระบวนการในการเชื่อมต่อระหว่างสายงาน มีมาตรฐานในการปฏิบัติอย่างชัดเจน เช่น ระเบียบในการส่งต่อ มาตรฐานการบริการ การเก็บข้อมูล และการรายงาน						
- มีการมอบหมายหน้าที่ของการร่วมกันทำงานทั้งในเรื่องของเวลา บุคคล อุปกรณ์ สิ่งอำนวยความสะดวกต่างๆ						
- มีการจัดการในการปฏิบัติตามแผนของเจ้าหน้าที่และการเชื่อมต่อระหว่างหน่วยงาน						
- การปฏิบัติคำนึงถึงค่านิยมของคนในชุมชนและองค์กรที่เกี่ยวข้อง						
- เจ้าหน้าที่และอาสาสมัครต่างมีการติดต่อกัน ระหว่างองค์กรอย่างไม่เป็นทางการอย่างสม่ำเสมอ						
รวม						
6. **การลดอุปสรรคที่ขัดขวางการมีส่วนร่วม**						
- มีการให้ความสำคัญของความแตกต่างขององค์กรในด้านของระดับของหน่วยงาน เป้าหมายและความรับผิดชอบ						
- มีกลุ่มทีมงานหลักทั้งด้านทักษะและความยึดมั่นซึ่งสามารถทำงานได้ต่อเนื่องจนจบโครงการของการมีส่วนร่วม						

	0	1	2	3	4	
	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง	
- มีโครงสร้างที่เป็นทางการในการแลกเปลี่ยนความรู้และแก้ปัญหาในการแบ่งหน้าที่รับผิดชอบ						
- มีรูปแบบอย่างไม่เป็นทางการในการบรรลุเป้าหมายร่วมด้วย						
- มีกลยุทธ์ในการรองรับทางเลือกที่เสนอภายในผู้มีส่วนร่วม						**รวม**
รวม						
7. **สะท้อนกลับและการรักษาการมีส่วนร่วมให้ดำเนินอย่างต่อเนื่อง**						
- มีกระบวนการในการตัดสินและแสดงความยินดีกับงานที่บรรลุเป้าหมายและหรือรางวัลในแต่ละบุคคล						
- ผู้มีส่วนร่วมสามารถแสดงให้เห็นถึงผลประโยชน์ที่ได้รับจากการทำงานที่ตนได้ทำ						
- มีการแสดงความต้องการและความยึดมั่นที่จะดำเนินงานต่อในช่วงกลางของโครงการ						
- มีแหล่งสนับสนุนทั้งภายในและภายนอกที่สามารถช่วยในการดำเนินงานได้อย่างต่อเนื่อง						
- มีกระบวนการในการปรับโครงสร้างของสมาชิกที่ส่วนร่วม และการเพิ่มหรือลดสมาชิก						**รวม**
รวม						
คะแนนรวมตามหัวข้อ						รวม
1. ความต้องการการมีส่วนร่วม						
2. การเลือกผู้มีส่วนร่วม						
3. ความมั่นใจในการมีประสิทธิภาพของการมีส่วนร่วม						
4. การวางแผนในการร่วมกันทำงาน						
5. การร่วมกันในการปฏิบัติตามแผนปฏิบัติการ						
6. การลดอุปสรรคที่ขัดขวางการมีส่วนร่วม						
7. สะท้อนกลับและการรักษาการมีส่วนร่วมให้ดำเนินอย่างต่อเนื่อง						

Appendix E

Action plan of community-based fall prevention model

Goal: To reduce the fall incidence among older adults in the community.

Objective: 1) To increase fall awareness in the community both self-awareness among older adults and community awareness.

2) To increase the knowledge of fall including fall risk factors and prevention strategies.

3) To reduce the risk of falls among older adults in the community including personal factors, behavior factors, and environment factors

The components of the community-based fall prevention model					
Intervention	**Description**	**Responsible people**	**Partners**	**Frequency**	**Coverage**
Mulitfactorial Fall risk assessment	Assessing multifactorial risks included: - Personal factors - Behavioral factors - Physical performance - Home environment	Public health nurse Zone leader team Public health volunteers	Interpersonal Fall prevention team Organization 6th public health center(PHC)	Once a year	100%
Fall Campaign	Fall campaign (Fall prevention weeks) aimed to increasing community awareness every year. (Warning & Slogan Sticker distribution)	Public health nurse Zone leader team Environment team	Interpersonal Fall prevention team Organization 6thPHC	Once a year	100%
Education program	Providing and sharing fall prevention strategies included - Fall protective Behaviors - Vision screening yearly - Medication use and side effect attention - Exercise strategies - Environment management **Handbook distribution** was provide at the first time and throughout intervention	Public health nurse Health professional	Interpersonal Fall prevention team Organization 6th PHC		

The components of the community-based fall prevention model (cont.)

Intervention	Description	Responsible people	Partners	Frequency	Coverage
Exercise group	-Exercise education class 1 day with handbook for exercise at home. - Group Strengthening and Balance training exercise for 45 minute which leaded by fall leader team - Add up hand & ball exercise	Zone leader team	Interpersonal Fall prevention team Organization The Crown Property Bureau	2 times a week throughout intervention period	64.28%
Home visit **- Medication review**	There was 2 components of intervention which consisted of **1. Medication review** and side effect assessment included: Dizziness, Orthostatic Hypotension, Muscle weakness, etc.	Public health nurse Zone leader team	Interpersonal Fall prevention team	Twice a year	100%
- Home hazard assessment	**2. Hazard assessment** and modify recommendation to older adults and their family including resources for modification	Public health nurse Zone leader team Environment team	Organization -6th PHC -The Crown Property Bureau		73.17%

The components of the community-based fall prevention model (cont.)

Intervention	Description	Responsible people	Partners	Frequency	Coverage
Fall management system	There was 2 components consisting				
- Fall surveillance	- Fall prevention center for notifying fall incidence and environment hazard. - Fall incidence recording and environment hazard notification record. - Summary every 6 month and referring to related organization	Zone leader team	<u>Interpersonal</u> Fall prevention team <u>Organization</u> - 6th PHC - Dusit district office -The Crown Property Bureau - Sukantaran temple - Rachawat market	Throughout of the year	100%
- Environment hazard management	- Community hazard assessment included walkway and public place nearby community (Temple and Market) - Initial modification such as warning sticker and warning sign. Then, notifying to related organization (District office)	Environment team		Twice a year	100%

Appendix F
Validation of instrument

Except standard instruments, all instruments in this study were verified content validity by four experts including one geriatric physician and three specialists in geriatric nursing. Instruments were modified according to the comments of the specialist. Then, the reliability of these instruments was examined.

Four experts who had validated the content validity of research instruments in this study included:

1. Assoc. Prof. Dr. Jiraporn Kespichayawattana
   Department of geriatric nursing
   Faculty of nursing, Chulalongkorn University
2. Assist. Prof. Dr. Noppawan Piaseu
   Department of community health, School of Nursing,
   Faculty of Ramathibodi Medicine Hosptial, Mahidol University
3. Dr. Orapitchaya Krairit
   Department of Geriatric medicine
   Faculty of Ramathibodi Medicine Hosptial, Mahidol University
4. Dr. Ladda Thiamwong
   Department of adult and geriatric nursing
   School of Nursing, Walailak University

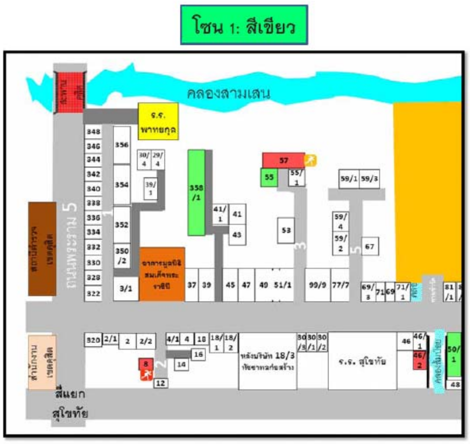
Appendix G

Document of fall prevention program

1. Fall Project symbol & Sticker

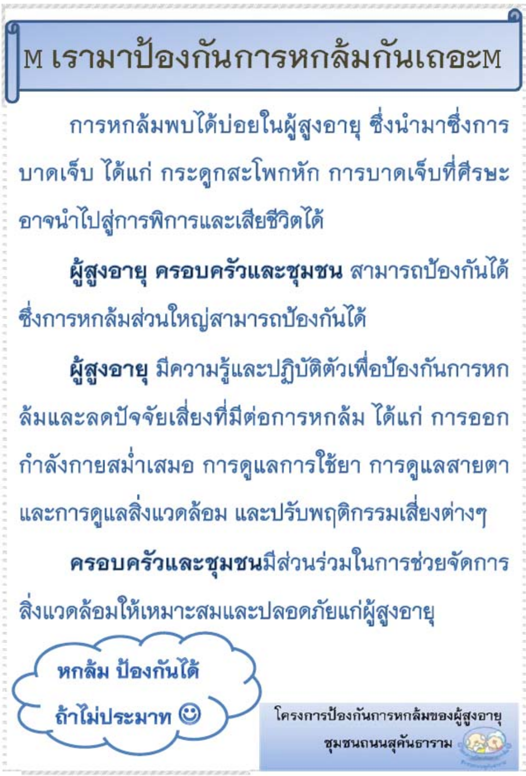
2. Fall Leader Team

3. Zone leader distribution



ตารางรายชื่อผู้สูงอายุ โซน 1 : สีเขียว											
ผู้รับผิดชอบ 1 คน: นางแดงต้อย กลิ่นหอม											
เลขที่	ชื่อ-สกุล			บ้านเลขที่	ให้ความรู้	สายตา	การทรงตัว	การเดิน	การใช้ยา	สิ่งแวดล้อม	code
1.	นาง	แดงต้อย	กลิ่นหอม	358/1							2
2.	นาย	สุชัย	อัศวะวิบูลย์	8 (ซอย2)							8
3.	นาง	ทองหล่อ	ชมชื่น	55 (ซอย 3)							3
4.	น.ส.	ประนอม	นุ้ยเฟื่องฟู	57 (ซอย 3)							17
5.	นาง	ประทุม	ดีปิ้น	46/2							37
6.	นาง	ยุพิณ	กำเสน	50/1							38
7.											
8.											
9.											
10.											
11.											
12.											
13.											
14.											
15.											

4. Fall campaign leaftlet



5. Surveillance record form

แบบรายงานการเฝ้าระวังการหกล้มของผู้สูงอายุชุมชนถนนสุคันธาราม									
เดือน.....พื้นที่โซน.....ผู้รับผิดชอบ.....									
ผู้สูงอายุที่หกล้ม				ลักษณะการหกล้ม				การรายงานและส่งต่อ	หมายเหตุ
วดป.	ชื่อ-สกุล	อายุ	บ้านเลขที่	สาเหตุ	สถานที่	การบาดเจ็บ	การรักษา		

แบบรายงานสิ่งแวดล้อมในชุมชนที่เสี่ยงต่อการหกล้ม					
เดือน.....พื้นที่โซน.....ผู้รับผิดชอบ.....					
วดป.	รายละเอียดสิ่งแวดล้อมที่ชำรุด (ระบุสถานที่และลักษณะที่เสี่ยง)	ผู้แจ้ง	ผู้รับแจ้ง	การรายงานและส่งต่อ	หมายเหตุ (ติดตามผลการส่งต่อ)

หมายเหตุ แนวทางการระบุละเอียดของการหกล้ม

สถานที่ ภายในตัวบ้าน ระบุสถานที่.....

ภายนอกตัวบ้าน: ภายในชุมชน ระบุระบุสถานที่ .....

ภายนอกชุมชน ระบุระบุสถานที่ .....

สาเหตุ สาเหตุของผู้สูงอายุ

สาเหตุทางด้านสิ่งแวดล้อม

การบาดเจ็บ ระบุการบาดเจ็บที่ได้รับ.....

การรักษา 1. นอนพักรักษาโรงพยาบาลนาน.....วัน

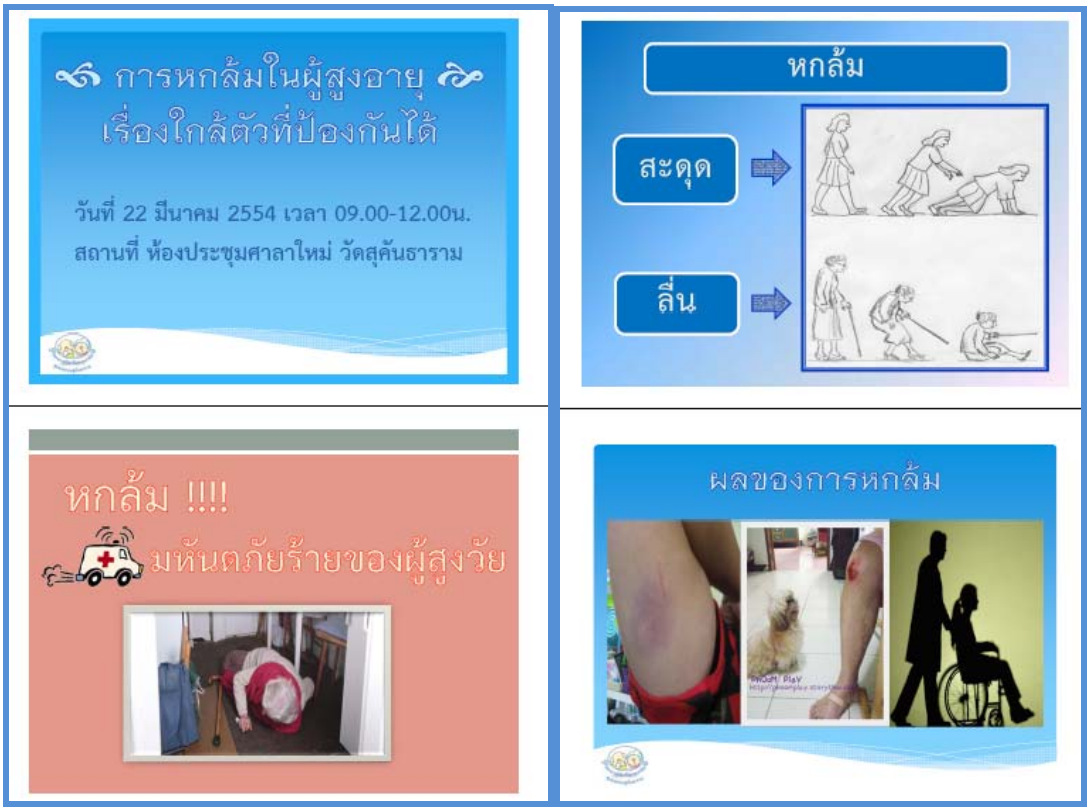
2. รับการรักษาที่แผนกฉุกเฉิน

3. รักษาเอง

4. ไม่ต้องรักษาเลย

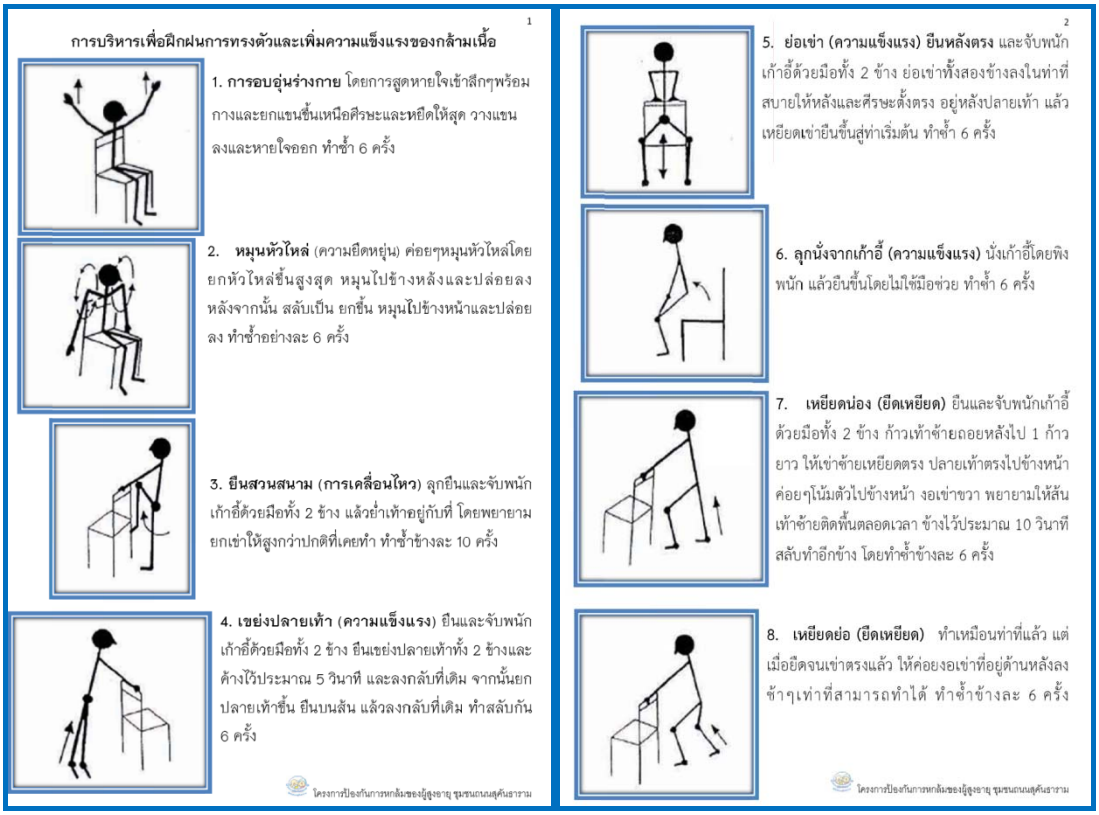
6. Fall leader &older adults handbook

7. Health education media



8. Exercise poster

9. Home exercise handbook (Barnett, 2003)



1

การบริหารเพื่อฝึกฝนการทรงตัวและเพิ่มความแข็งแรงของกล้ามเนื้อ

1. **การอบอุ่นร่างกาย** โดยการสูดหายใจเข้าลึกๆพร้อมกางและยกแขนขึ้นเหนือศีรษะและหยีดให้สุด วางแขนลงและหายใจออก ทำซ้ำ 6 ครั้ง

2. **หมุนหัวไหล่** (ความยืดหยุ่น) ค่อยๆหมุนหัวไหล่โดยยกหัวไหล่ขึ้นสูงสุด หมุนไปข้างหลังและปล่อยลง หลังจากนั้น สลับเป็น ยกขึ้น หมุนไปข้างหน้าและปล่อยลง ทำซ้ำอย่างละ 6 ครั้ง

3. **ยืนสวนสนาม (การเคลื่อนไหว)** ลุกยืนและจับพนักเก้าอี้ด้วยมือทั้ง 2 ข้าง แล้วย่ำเท้าอยู่กับที่ โดยพยายามยกเข่าให้สูงกว่าปกติที่เคยทำ ทำซ้ำข้างละ 10 ครั้ง

4. **เขย่งปลายเท้า (ความแข็งแรง)** ยืนและจับพนักเก้าอี้ด้วยมือทั้ง 2 ข้าง ยืนเขย่งปลายเท้าทั้ง 2 ข้างและค้างไว้ประมาณ 5 วินาที และลงกลับที่เดิม จากนั้นยกปลายเท้าขึ้น ยืนบนส้น แล้วลงกลับที่เดิม ทำสลับกัน 6 ครั้ง

โครงการป้องกันการหกล้มของผู้สูงอายุ ชุมชนถนนสุคันธาราม

2

5. **ย่อเข่า (ความแข็งแรง) ยืนหลังตรง** และจับพนักเก้าอี้ด้วยมือทั้ง 2 ข้าง ย่อเข่าทั้งสองข้างลงในท่าที่สบายให้หลังและศีรษะตั้งตรง อยู่หลังปลายเท้า แล้วเหยียดเข่ายืนขึ้นสู่ท่าเริ่มต้น ทำซ้ำ 6 ครั้ง

6. **ลุกนั่งจากเก้าอี้ (ความแข็งแรง)** นั่งเก้าอี้โดยพิงพนัก แล้วยืนขึ้นโดยไม่ใช้มือช่วย ทำซ้ำ 6 ครั้ง

7. **เหยียดน่อง (ยืดเหยียด)** ยืนและจับพนักเก้าอี้ด้วยมือทั้ง 2 ข้าง ก้าวเท้าซ้ายถอยหลังไป 1 ก้าวยาว ให้เข่าซ้ายเหยียดตรง ปลายเท้าตรงไปข้างหน้า ค่อยๆโน้มตัวไปข้างหน้า งอเข่าขวา พยายามให้ส้นเท้าซ้ายติดพื้นตลอดเวลา ค้างไว้ประมาณ 10 วินาที สลับทำอีกข้าง โดยทำซ้ำข้างละ 6 ครั้ง

8. **เหยียดย่อ (ยืดเหยียด)** ทำเหมือนท่าที่แล้ว แต่เมื่อยืดจนเข่าตรงแล้ว ให้ค่อยงอเข่าที่อยู่ด้านหลังลงข้าๆเท่าที่สามารถทำได้ ทำซ้ำข้างละ 6 ครั้ง

โครงการป้องกันการหกล้มของผู้สูงอายุ ชุมชนถนนสุคันธาราม

10. Balance training instruction

ท่ากายบริหารเพื่อฝึกฝนการทรงตัวและเพิ่มความแข็งแรงของกล้ามเนื้อที่ใช้ในการออกกำลังกายกลุ่ม ประกอบด้วย ท่านั่ง 11 ท่า และท่ายืน 7 ท่า

ท่ากายบริหารในท่านั่ง

ท่าที่ 1 ท่าอบอุ่นร่างกาย

นั่งตัวตรง สูดหายใจเข้าลึกๆ พร้อมกางและยกแขนขึ้นเหนือศีรษะและยืดให้สุด วางแขนลงช้าๆ พร้อมหายใจออก นับ 1 ทำซ้ำ ครั้ง

ท่าที่ 2 ท่าหมุนหัวไหล่

นั่งตัวตรง ค่อยๆหมุนหัวไหล่โดยยกหัวไหล่ขึ้นสูงสุด หมุนไปข้างหลังและปล่อยลง หลังจากนั้น สลับเป็น ยกขึ้น หมุนไปข้างหน้าและปล่อยลง ทำซ้ำอย่างละ 6 ครั้ง

ต่อจากนั้น ก้มศีรษะลง พยายามให้คางจรดหน้าอกมากที่สุดเท่าที่จะทำได้ หยุดค้างไว้ 10 วินาที นับ 1-10 ทำทั้งหมด 5 ครั้ง

ท่าที่ 4 ท่ายกแขน

นั่งตัวตรง ยกแขนซ้ายขึ้นข้างศีรษะจนรู้สึกตึงที่แขน หยุดค้างไว้เล็กน้อย แล้วค่อยๆปล่อยแขนข้างลำตัว ทำเช่นนี้ 10 ครั้ง เสร็จแล้วสลับมาทำแขนขวา ยกแขนขวาขึ้นจนรู้สึกตึงที่แขน หยุดค้างไว้เล็กน้อย แล้วค่อยปล่อยแขนลงด้านลำตัว ทำเช่นนี้ 10 ครั้ง

หลังจากนั้น ให้ยกแขนสองข้างขึ้นพร้อมกันเหนือศีรษะ จนรู้สึกตึงที่แขน หยุดค้างไว้เล็กน้อย ทำเช่นนี้ 10 ครั้ง

ท่าที่ 5 ท่ากรรเชียง

นั่งตัวตรง เหยียดแขนซ้ายไปข้างหน้า งอศอก พร้อมกับดึงแขนมาข้างลำตัว หยุดค้างไว้เล็กน้อย แล้วเหยียดแขนกลับไปอยู่ท่าเดิม เหยียด เริ่มนับเป็นหนึ่ง ดึงแขนกลับมานับเป็นสอง ทำทั้งหมด 20 ครั้ง

หลังจากนั้น วางแขนซ้ายข้างลำตัว สลับมาทำแขนขวา เหยียดแขนขวาไปข้างหน้า งอศอก ศอก พร้อมกับดึงแขนมาข้างลำตัว หยุดค้างไว้เล็กน้อย ทำทั้งหมด 20 ครั้ง

ต่อไปให้เหยียดแขนทั้งสองข้างไปพร้อมๆกัน งอศอก พร้อมกับเอาแขนทั้งสองข้างมาข้างลำตัว หยุดค้างไว้เล็กน้อยแล้วกลับไปทำท่าเดิม ทำทั้งหมด 20 ครั้ง

ท่าที่ 6 ท่าเหยียดหลัง

นั่งตัวตรง แยกขาออกพอประมาณ วางมือทั้งสองข้างบริเวณเข่าซ้าย แล้วค่อยๆ เลื่อนมือลงไปถึงข้อเท้า หยุดค้างไว้เล็กน้อย แล้วค่อยเลื่อนมือทั้งสองกลับมาที่เดิม พร้อมกับยกลำตัวขึ้นตั้งตรง ทำอย่างนี้ 10 ครั้ง เสร็จแล้วสลับมาทำด้านขวาอีก10 ครั้ง

ท่าที่ 7 ท่าเหยียดข้อเท้า

ให้ยกเท้าซ้ายขึ้นและกระดกข้อเท้าขึ้นให้มากที่สุดเท่าที่ทำได้ ต่อจากนั้นจิกปลายเท้าลงให้มากที่สุด ขึ้นลง นับเป็น 1 ครั้ง ทำทั้งหมด 10 ครั้ง หลังจากนั้นหมุนข้อเท้าไปตามเข็มนาฬิกา หรือหมุนไปทางด้านขวา ทำทั้งหมด 10 ครั้งเสร็จแล้วสลับมาทำด้านขวาเหมือนด้านซ้าย

ท่าที่ 8 ท่าเหยียดเข่า

นั่งตัวตรง เหยียดเข่าซ้ายขึ้นมาให้ตรง เกร็งแล้วหยุดค้างไว้ แล้วดึงเท้าซ้ายกลับมาวางบนพื้น ทำอย่างนี้ 10 แล้วสลับมาทำเข่าขวา อีก10 ครั้ง

ท่าที่ 9 ท่าเตะเท้า

นั่งตัวตรง เตะเท้าขึ้นลง โดยการเกร็งและงอเข่า เริ่มต้นที่ข้อเท้าซ้าย 10 ครั้ง

ท่าที่ 10 ท่านั่งสวนสนาม

ให้นั่งตัวตรง ขยับเข่าขึ้นลงสลับกัน พยายามยกเข่าให้สูง ทำซ้ำ 10 ครั้ง

ท่าที่ 11 ท่าลุกจากเก้าอี้

นั่งเก้าอี้โดยพิงพนัก แล้วยืนขึ้นโดยไม่ใช้มือช่วย ทำซ้ำ 6 ครั้ง เริ่มนับ 1-6

การบริหารกายในท่ายืน ประกอบด้วย 7 ท่า

ท่าที่ 1 ท่ายืนสวนสนาม

ลุกยืนตัวตรง มือทั้ง 2 ข้างจับพนักเก้าอี้ที่มีความมั่นคง แล้วย่ำเท้าอยู่กับที่ โดยพยายามยกเข่าให้สูงกว่าปกติที่เคยทำ ทำซ้ำข้างละ 10 ครั้ง

ท่าที่ 2 ท่าเขย่งปลายเท้าสลับยืนบนส้นเท้า

ยืนตัวตรง แยกเท้าทั้งสองข้างให้ห่างกันพอประมาณ มือทั้งสองจับพนักเก้าอี้ เพื่อช่วยพยุงตัว ยืนเขย่งปลายเท้าหยุดค้างไว้ 5 วินาที นับ 1-5 แล้วลงกลับที่เดิม จากนั้นยกปลายเท้าขึ้นพร้อมกับยืนบนส้นเท้า หยุดค้างไว้ 5 วินาที นับ 1-5 แล้วลงกลับที่เดิม ให้ทำสลับไปมา6 ครั้ง

ท่าที่ 3 ท่าย่อเข่า

ยืนตัวตรง มือจับพนักเก้าอี้ งอหรือย่อเข่า 2 ข้างลงพอประมาณ ในท่าสบายโดยให้หลังและศีรษะตั้งตรงหลังปลายเท้า แล้วเหยียดเข่ากลับไปสู่ท่าเริ่มต้น ทำอย่างนี้ 10 ครั้ง

ท่าที่ 4 ท่าเหวี่ยงขาออกด้านข้าง

ยืนตัวตรง มือจับพนักเก้าอี้ ยกขาซ้ายออกไปด้านข้าง โดยให้ปลายเท้าชี้ไปข้างหน้า ขาเยียดตรง เอวตั้งตรงไม่เอียง เริ่มต้นนับ 1-10 หลังจากนั้นสลับมาทำด้านขวา 10 ครั้ง

ท่าที่ 5 ท่าเหยียดน่อง

ยืนตัวตรง มือสองข้างจับพนักเก้าอี้ที่มีความมั่นคง ก้าวเท้าซ้ายไปข้างหลังหนึ่งก้าวยาว ให้เข่าซ้ายเหยียดตรง โดยปลายเท้าทั้งสองชี้ตรงไปข้างหน้า แล้วค่อยๆโน้มตัวไปข้างหน้า งอเข่าขวาเล็กน้อย โดยพยายามให้เท้าซ้ายอยู่ติดพื้นตลอดเวลา หยุดข้างไว้ 10 วินาที เริ่มต้นนับ 1-10 วินาที แล้วดึงเท้าซ้ายกลับที่เดิม เสร็จแล้วสลับมาทำขาขวา ทำซ้ำข้างละ 6 ครั้ง

ท่าที่ 6 ท่าเหยียดย่อ

ท่านี้ทำเหมือนเหยียดน่อง แต่เมื่อยืดจนเข่าตรงแล้ว ให้ค่อยงอเข่าที่อยู่ด้านหลังลงช้าๆเท่าที่สามารถทำได้

เริ่มด้วยยืนตัวตรง มือสองข้างจับพนักเก้าอี้ที่มีความมั่นคง ก้าวเท้าซ้ายไปข้างหลังหนึ่งก้าวยาว ให้เข่าซ้ายเหยียดตรง โดยปลายเท้าทั้งสองชี้ตรงไปข้างหน้า แล้วค่อยๆโน้มตัวไปข้างหน้า งอเข่าขวาเล็กน้อย โดยพยายามให้เท้าซ้ายอยู่ติดพื้นตลอดเวลา หยุดข้างไว้ 10 วินาที หลังจากนั้นค่อยๆงอเข่าซ้ายช้าๆ เท่าที่สามารถทำได้ แล้วดึงเท้าซ้ายกลับที่เดิม เสร็จแล้วสลับมาทำขาขวา ทำซ้ำข้างละ 6 ครั้ง

ท่าที่ 7 ท่ายืนต่อขา

เริ่มแรกในท่าเตรียม ให้จับพนักเก้าอี้ที่มีความมั่นคง และพยายามยืนต่อเท้าในข้างที่ถนัดในแนวเส้นตรง หลังจากนั้นค่อยๆปล่อยมือ เพื่อเพิ่มการทรงตัว นับ 1-10 โดยระหว่างนั้นหากผู้สูงอายุท่านใดสูญเสียการทรงตัวให้จับพนักเก้าอี้ทันทีเพื่อป้องกันการหกล้ม

Appendix H

Fall prevention program activities

Project opening

Mapping &interviwing key persons

Project information

Risk assessment

Focus group in fallersFocus group in leaders

A-I-C group discussion

Fall campaign

Health education

Exercise group activity

Others activities in exercise group

Like Flowers : Exercise breathing music Ball: coordination practices

After getting canvas shoes support

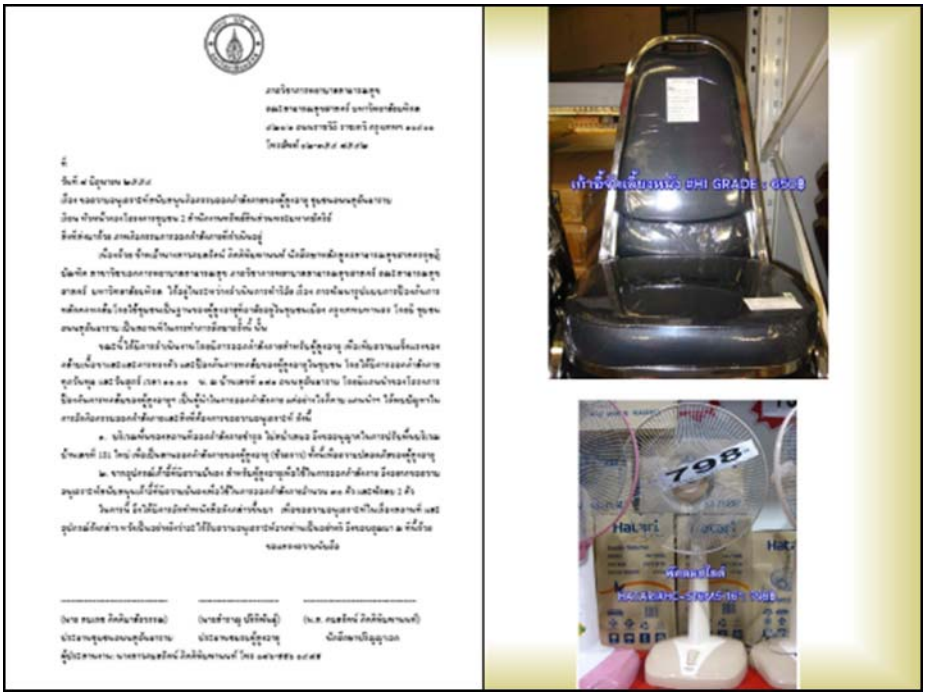
Home visit activity

Community environment assessment activity

Partnership networks

District bureau office

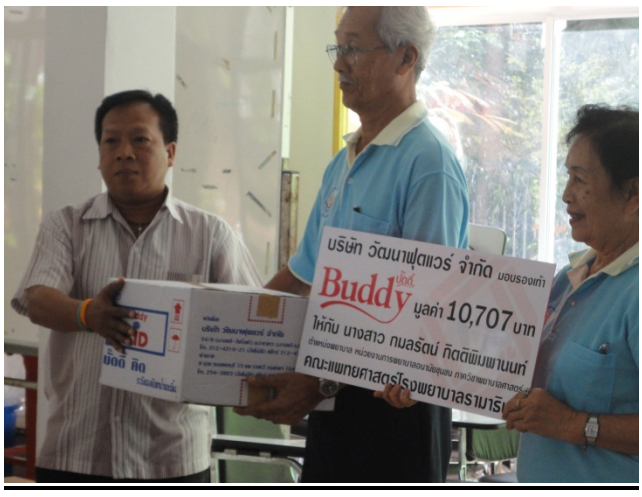
The Crown Bureau Property



Partnership networks (cont.)

Temple & Market

Private company



Example: Home environmentmodification

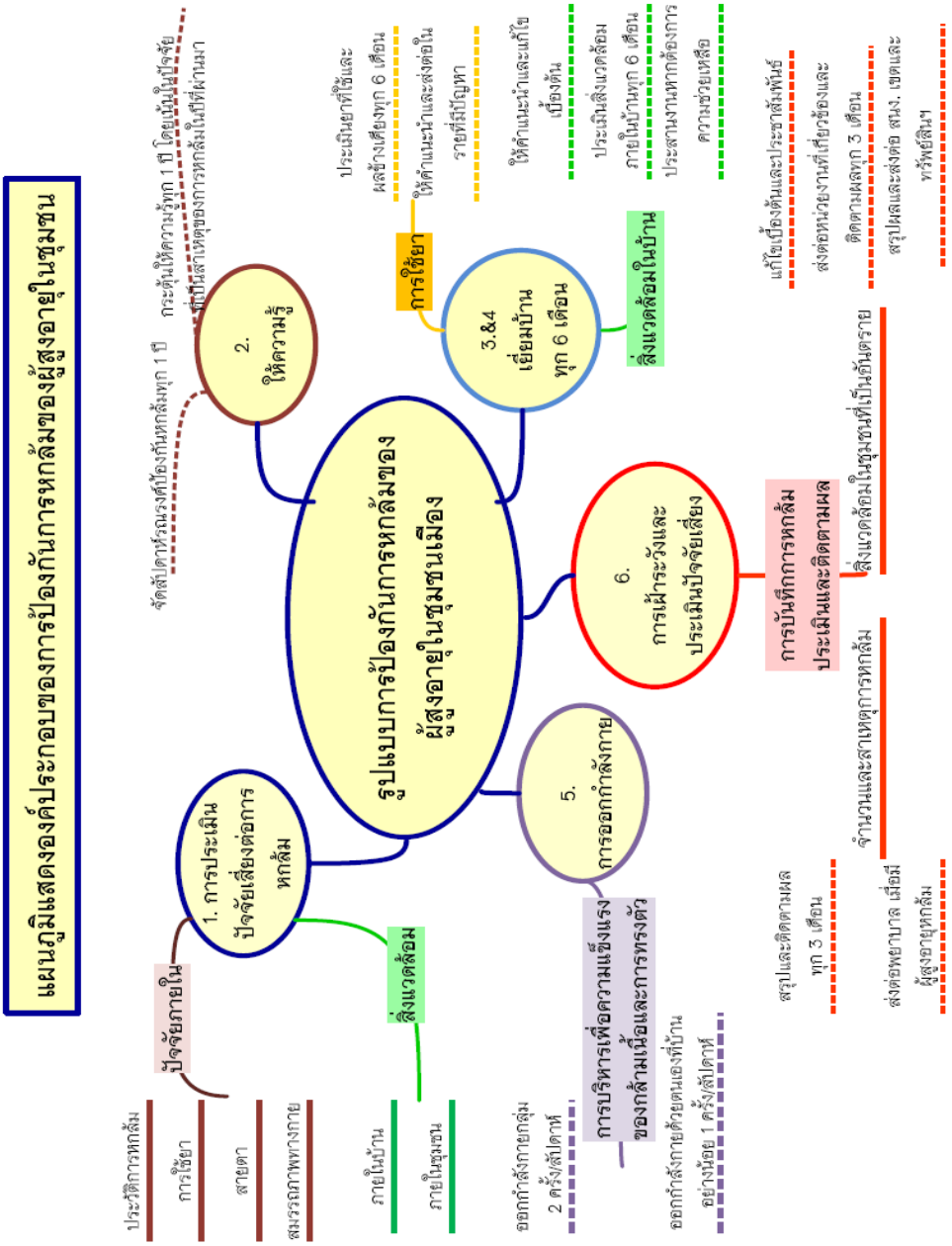
Before

After

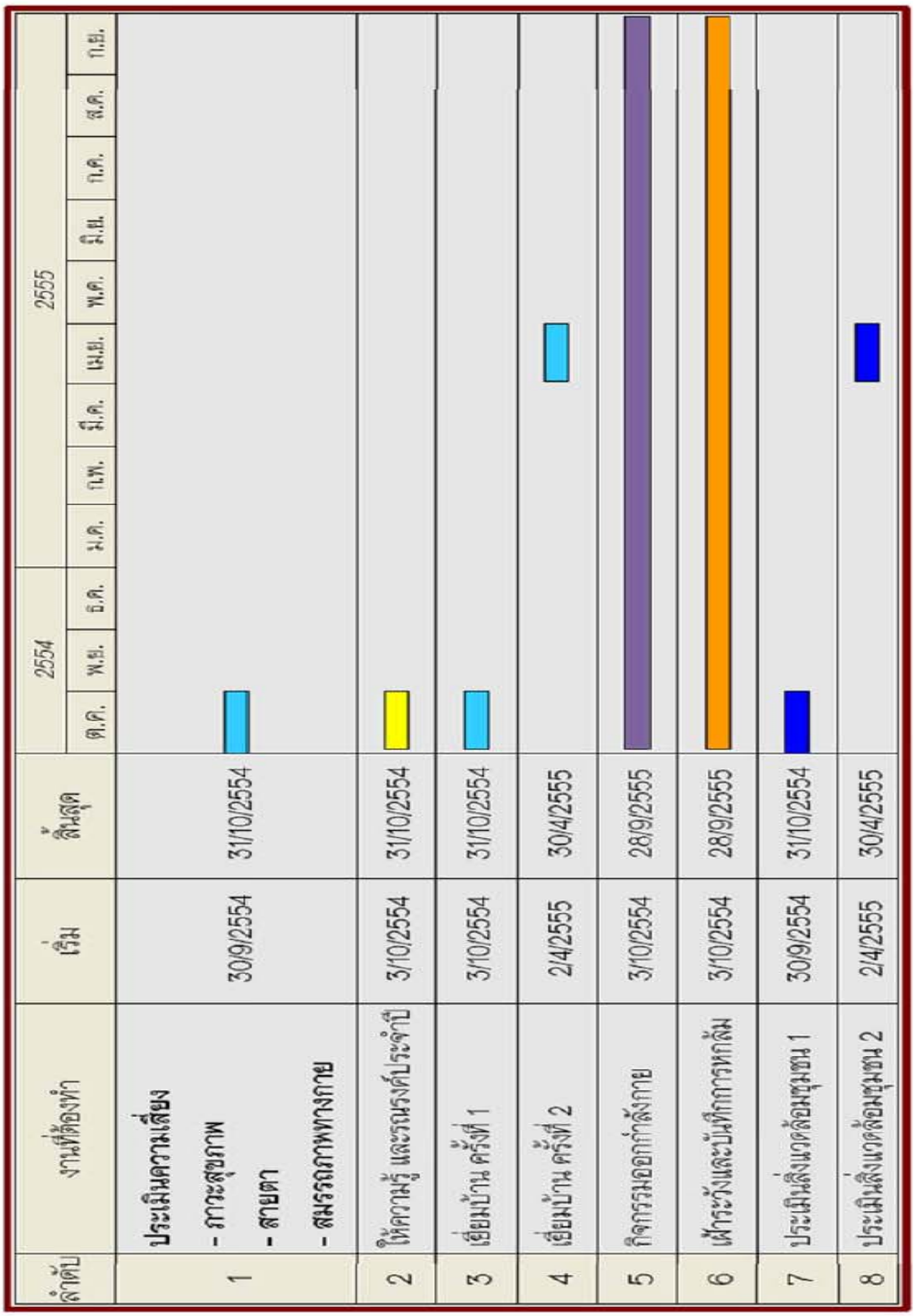
Appendix I

Fall prevention model in Sukantaram Road community

1. Diagram of fall prevention model



2. Timeline of fall prevention model



ลำดับ	งานที่ต้องทำ	เริ่ม	สิ้นสุด	2554						2555						
				ต.ค.	พ.ย.	ธ.ค.	ม.ค.	ก.พ.	มี.ค.	เม.ย.	พ.ค.	มิ.ย.	ก.ค.	ส.ค.	ก.ย.
1	ประเมินความเสี่ยง - ภาวะสุขภาพ - สายตา - สมรรถภาพทางกาย	30/9/2554	31/10/2554												
2	ให้ความรู้ และรณรงค์ประจำปี	3/10/2554	31/10/2554												
3	เยี่ยมบ้าน ครั้งที่ 1	3/10/2554	31/10/2554												
4	เยี่ยมบ้าน ครั้งที่ 2	2/4/2555	30/4/2555												
5	กิจกรรมออกกำลังกาย	3/10/2554	28/9/2555												
6	เฝ้าระวังและบันทึกการหกล้ม	3/10/2554	28/9/2555												
7	ประเมินสิ่งแวดล้อมชุมชน 1	30/9/2554	31/10/2554												
8	ประเมินสิ่งแวดล้อมชุมชน 2	2/4/2555	30/4/2555												

3. Guideline for fall prevention model management

กิจกรรมในการป้องกันการหกล้มของผู้สูงอายุ ชุมชนถนนสุคันธาราม			
กิจกรรม	**ผู้รับผิดชอบ**	**ความถี่ของกิจกรรม**	**ช่วงเวลาทำกิจกรรม**
1. รายงานการเฝ้าระวังการหกล้มและสิ่งแวดล้อมที่เป็นอันตราย	1. คุณวรรณี 2. คุณสมใจ มุ่ง	สรุปผลทุก 6 เดือน	ตลอดปี สรุปผล: ตุลาคม เมษายน
2. การออกกำลังกาย	1. คุณแดงต้อย 2. คุณณัฐฐิยา 3. คุณทัศนีย์	– ทุกวัน พุธ และศุกร์ – เยี่ยมบ้านกระตุ้นออกกำลังกายในรายที่มาไม่ได้	ตลอดปี
3. การประเมินและจัดการสิ่งแวดล้อมชุมชน	1. คุณสมเดช 2. คุณศักดา 3. คุณสำราญ 4. คุณยวง	– ประเมินทุก 6 เดือน – ดำเนินการแก้ไขและประสานงานส่งต่อเมื่อได้รับแจ้งหรือพบสิ่งแวดล้อมที่เป็นอันตราย – ติดตามผลทุก 3 เดือน	ตุลาคม เมษายน
4. การเยี่ยมบ้านดูเรื่องการใช้ยาและผลข้างเคียงของยา และสิ่งแวดล้อมภายในบ้าน	1. คุณโสภา 2. คุณประคอง 3. คุณสมใจ ฉัตร 4. คุณทองคำ	– ทุก 6 เดือน – ติดตามผลทุก 3 เดือน	ตุลาคม เมษายน
5. การประเมินความเสี่ยงต่อการหกล้มและให้ความรู้และรณรงค์ประจำปี	ศูนย์บริการสาธารณสุข 6 แกนนำ	ทุกปี	ตุลาคม

แนวทางการจัดการเมื่อมีผู้สูงอายุหกล้ม

1. ซักประวัติและสอบถามเกี่ยวกับการหกล้มที่เกิดขึ้น ตามแบบบันทึกข้อมูลการหกล้ม

2. หัวหน้าโซนแจ้งพยาบาล ศบส. 6 เพื่อติดตามเยี่ยมบ้านพร้อมแกนนำ เพื่อให้คำแนะนำพร้อมทั้งหาทางป้องกันการหกล้มครั้งต่อไป

แนวทางการจัดการเมื่อสิ่งแวดล้อมในบ้านเสี่ยงต่อการหกล้ม

1. แกนนำประเมินสิ่งแวดล้อมภายในบ้าน

2. ติดสติ๊กเกอร์เตือนระวัง สะดุดหรือลื่น บริเวณที่เสี่ยง

3. แนะนำญาติและผู้สูงอายุในการปรับแก้ไข

4. แกนนำให้ความช่วยเหลือในการติดตั้งราวจับ...เมื่อผู้สูงอายุต้องการ

5. ติดตามประเมินทุก 3 เดือน

แนวทางการจัดการเมื่อสิ่งแวดล้อมในชุมชนเสี่ยงต่อการหกล้ม

1. มีศูนย์รับแจ้งสิ่งแวดล้อมที่ชำรุดภายในชุมชน โดยมีการรวบรวมทุก 6 เดือน

2. ติดป้ายเตือนระวัง สะดุดหรือลื่น บริเวณที่เสี่ยงและประชาสัมพันธ์ภายในชุมชนเพื่อระวังในการเดินผ่าน

3. ดำเนินการแก้ไขโดยแกนนำ...ถ้าสามารถแก้ได้

4. ติดต่อหน่วยงานรับผิดชอบ (สำนักงานเขตตุลิต) เพื่อดำเนินการแก้ไข

5. ติดตามประเมินทุก 3 เดือน

BIOGRAPHY

NAME	Miss Kamonrat Kittipimpanon
DATE OF BIRTH	24 August 1980
PLACE OF BIRTH	Bangkok, Thailand
INSTITUTION ATTENDED	MahidolUniversity, 2001: Bachelor of Nursing Science MahidolUniversity, 2006: Master of Nursing Science (Adult Nursing) Mahidol University, Doctor of Public Health (Public Health Nursing)
THESIS SUPPORTED FUND	National Research Council of Thailand
POSITION & OFFICE	Ramathibodi School of Nursing, Faculty of Medicine Ramathibodi Hospital Bangkok, Thailand Position: Lecturer Tel. 02-2011832 E-mail: kkamonrat@gmail.com
HOME ADDRESS	40 SoiRamkumhang 82, Sukapibarn 3 Rd, Bangkapi Bangkok, Thailand