นิพนธ์ต้นฉบับ

การศึกษาพัฒนาการของนโยบายและผลลัพธ์ของการดูแลผู้ป่วยเบาหวานในระบบสุขภาพ อำเภอพาน จังหวัดเชียงราย ในปี 2554–2556

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บทคัดย่อ

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษารูปแบบและผลลัพธ์การดูแลผู้ป่วยเบาหวานอำเภอพาน จังหวัด เชียงราย ในปี 2554–2556 เป็นการศึกษาย้อนหลัง โดยศึกษาจากเอกสารการวิจัย และรายงานการดำเนินงานต่างๆที่ เกี่ยวข้อง และข้อมูลของผู้ป่วยเบาหวานที่จัดเก็บในระบบอิเล็กทรอนิกส์จำนวน 147 รายที่โอนจากโรงพยาบาลพาน ไปรับการรักษาต่อเนื่องที่ศูนย์สุขภาพชุมชนตำบลม่วงคำ รวมทั้งการสัมภาษณ์ระดับลึกกับแพทย์ พยาบาลและ เจ้าหน้าที่ ศูนย์สุขภาพชุมชนตำบลม่วงคำ ที่เกี่ยวข้องจำนวน 10 ราย สถิติที่ใช้ในการวิเคราะห์ประกอบด้วย สถิติเชิง พรรณนา และวิเคราะห์ความสัมพันธ์ด้วยสถิติ Chi-square test ระบบการดูแลผู้ป่วยเบาหวาน อำเภอพาน จังหวัด เชียงรายส่วนใหญ่ผู้ป่วยเบาหวาน มารับการตรวจรักษาในโรงพยาบาลพานเป็นหลัก จำนวนผู้ป่วยเบาหวานมีจำนวน เพิ่มขึ้นในแต่ละปี ปี 2556 ผู้ป่วยเบาหวานมีจำนวน 5,361 ราย เพิ่มจากปี 2554 จำนวน 918 ราย จากจำนวนผู้ป่วยที่ เพิ่มขึ้น และจำนวนผู้ให้บริการเท่าเดิม ทำให้เกิดความแออัดในการมารับบริการในโรงพยาบาล ส่งผลให้คุณภาพการ ดูแลผู้ป่วย ขาดคุณภาพ การประเมินผู้ป่วยไม่ครอบคลุม การจัดการปัญหาด้านสุขภาพ และการให้ข้อมูลผู้ป่วยไม่ ครบถ้วน การบริการมีความเร่งรีบ ปัญหาดังกล่าวนอกจากส่งผลต่อคุณภาพโดยตรงแล้ว ยังส่งผลให้ผู้ป่วยจำนวนหนึ่ง ไม่มาตรวจรักษาตามนัด เนื่องจากมีความลำบากในการมารับยาต่อเนื่อง เป็นผลให้ผู้ป่วยผู้ป่วยเบาหวาน มีภาวะ น้ำตาลในเลือดสูงเกิน ต้องมารับการรักษาด้วยอาการแผลที่เท้าเรื้อรัง การมองเห็นผิดปกติ รวมทั้งโรคหลอดเลือดสมอง และหัวใจ เครือข่ายบริการสุขภาพอำเภอพาน (District Health system : DHS) จึงจัดระบบส่งต่อและการดูแล ประชาชนในพื้นที่อย่างเป็นระบบ ตั้งแต่ ก่อนป่วย ขณะป่วย และการป้องกันภาวะแทรกซ้อน และการดูแลหลังพบ ภาวะแทรกซ้อนเกิดขึ้น โดยใช้กรอบการบริหารจัดการโรคในภาพรวมแบบเชิงรุก (pro-active, population-based approach) ระบุหรือค้นหาผู้ป่วยโรคเรื้อรังตั้งแต่เริ่มแรกของวงจรการเกิดโรค (ซึ่งยังไม่มีภาวะแทรกซ้อน) เพื่อป้องกัน หรือชะลอให้โรคพัฒนาไปและลดภาวะแทรกซ้อนที่มีแนวโน้มเกิดขึ้น ผลการศึกษาชี้ว่า ปี 2556 เครือข่ายบริการ สุขภาพอำเภอพานทำให้ผู้ป่วยเบาหวานที่ได้รับการส่งต่อให้ไปรับบริการที่ศูนย์สุขภาพชุมชนตำบลม่วงคำ ใช้เวลาใน การไปรับบริการน้อยลง และได้รับบริการตรวจเลือดและสุขภาพอื่นๆมากขึ้น เมื่อเทียบกับปี 2554 อย่างไรก็ตามการ พัฒนาบริการและระบบข้อมูลที่จำเป็นด้านการส่งเสริม ป้องกัน และดูแลรักษาผู้ป่วยเบาหวานร่วมกันให้สมบูรณ์ ครบถ้วน ถูกต้องและเชื่อมโยงระหว่างศูนย์สุขภาพชุมชนตำบลม่วงคำและโรงพยาบาลพาน และการให้ชุมชน (อบต. อสม. และเจ้าหน้าที่ รพสต) เข้ามามีส่วนร่วมในการออกแบบบริการร่วมกันเพื่อระบุหรือค้นหาผู้ป่วยโรคเรื้อรังตั้งแต่ เริ่มแรกของวงจรการเกิดโรคและลดภาวะแทรกซ้อนที่มีแนวโน้มจะเกิดขึ้น ยังมีความจำเป็นต้องพัฒนาอย่างต่อเนื่อง

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Original Article

The Development of the District Health System and Outcomes of Care for Patients with Diabetes at Phan District, Chiang Rai Province During 2011-13

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Abstract

This research had the objective to study the model and outcomes of care for diabetes patients in Phan District of Chiang Rai Province during 2011-13. This study used a retrospective research design and collected electronically-stored data on 147 diabetes patients in Phan District Hospital who then received follow-up care at the Muang Kham Primary care unit (PCU). These data were supplemented by in-depth interviews with ten doctors, nurses and staff of the PCU. The quantitative data were analyzed by descriptive statistics and Chi-square test.

In the past, the system of care for diabetes patients in Phan District was mostly passive, in that most cases came for treatment at the district hospital. The total number of registered diabetes cases is increasing over time and reached 5,361 in 2013 (an increase of 918 over 2011). The large and growing caseload is straining the hospital facilities and is causing over-crowding and rushed service, with no increase in clinicians or staff. This is eroding the quality of care, and patients do not always receive comprehensive evaluations, determination of related health problems, or complete health information about their condition. The decline in quality of care is also discouraging some cases from going for drug resupply at the hospital, which can result in blood-sugar imbalance, chronic foot sores, impaired vision, or even stroke. To address the current and future challenges of health care, Phan District has started to implement a District Health System (DHS) which consists of a network of linked facilities throughout the district. The DHS ensures that the population will be seen before illness develops and during illness for management of complications and post-complication care. The DHS uses a pro-active, population-based approach and attempts to identify all persons in the district who have chronic illness, especially those in the early, pre-complication stage of illness. In this way, the condition can be managed and complications can be prevented. This study found that the DHS improved referral for diabetes patients to the Muang Kham PCU, and thereby reduced travel time for the patients, instead of requiring them to go to the Phan District Hospital. There was an increase in clients who received blood tests and other health screening in 2013 when compared with 2011. However, there need to be improvements in the services and data system for comprehensive health promotion, prevention and care for diabetes patients that is complete and accurate. There need to be links among the Muang Kham PCU and Phan District Hospital. There needs to be more involvement of the community (i.e., Tambon administrative organizations, village health volunteers and staff of the Tambon Health Promotion Hospital) in the design of services, especially in documenting existing cases and finding new cases at the earliest stages of the disease cycle to reduce complications of diabetes.

Keyword: District Health System, Diabetes, Outcomes

Introduction

Non communicable diseases (NCDs) are the leading cause of death globally, killing more people each year than all other causes combined. Contrary to popular opinion, available data demonstrate that nearly 80% of NCD deaths occur in low- and middle-income countries (World Health Organization [WHO], 2010). The combined burden of these diseases is rising fastest among lower-income countries, populations and communities, where they impose large, avoidable costs in human, social and economic terms. About one-fourth of global NCD-related deaths take place before the age of 60 (WHO, 1999, 2014).

At present, among Thais who die of NCD, 60% are due to diabetes, hypertension, cardiovascular disease, or cancer. Fully 90% of NCD are related to poor health behaviors, e.g., inadequate exercise, overweight, smoking, excessive alcohol consumption, excessive consumption of non-nutritious foods such as overly sweet, fatty or salty foods, and reduced consumption of vegetables (Bundhamcharoen et al., 2011). Research conducted by the Department of Health in 2011 found that Thai average consumption of vegetables was 1.8 grams per person per day (Rawdaree, 2006).

Hospital diabetes clinic caseloads for 2010-12 reached 4005, 4,413 and 4,787 cases respectively at Phan District Hospital, Chiang Rai Province, in Northern Thailand (Mathers & Loncar, 2006). The steadily increasing caseloads are straining the clinical care system, particularly in the area of disease control, and prevention of complications among cases who have difficulty controlling blood sugar (who represent 11,046 cases or 75.7%) (Health Information System Development Office, 2009). Research into the factors why some diabetes patients are unable to control their blood sugar reveals that these cases do not take their medicine regularly, deviate from their prescribed dosages, do not maintain a healthy diet, do not exercise, and lack close monitoring, especially for the elderly cases. Some of the problem is due to lack of proper care and limited capacity of the clinical facility or Primary care unit (PCU). The more knowledgeable practitioners cannot always see what is going on at the primary care level and there is a lack of service linkages to provide holistic care. This results in gaps between the primary and secondary levels of care. The PCU themselves are straining from the increased caseload burden, and this causes delays in care which result in preventable complications, especially chronic sores, which led to amputation in 16 cases. At the societal level, unhealthy eating habits and sedentary lifestyles are also contributing to increased risk for diabetes. This points to the need for more surveillance of persons-at-risk of diabetes at the community level to prevent disease progression and complications. Participatory action research is needed to identify the most cost-effective ways to manage cases, and how best to increase the involvement of patients and their families in care (Task Force on the Study of Disease Burden, 2009). There need to be more multi-disciplinary teams to improve services and promote shared learning and correct understanding of the actual situation so that they can brainstorm together on how best to implement interventions (Institute for Community Health Systems Research and Development, 2009; Ministry of Public Health, 2011).

Methods

This research had the objective to study the model and outcomes of care for diabetes patients in Phan District during 2011-13. This study used a retrospective research design and collected electronically-stored data from 147 patients. The case inclusion criteria consisted of the following:

1. Diabetes patients not requiring insulin injections;

2. Diabetes patients being treated with a therapy in the Biguanide group, e.g., Metformin 500 mg. or Sulfonylurea group, e.g., Glibencamide (5 mg); or Glipizide (5 mg.);

3. Diabetes patients with no co-condition such as thyroid illness, gout, or Chronic obstructive pulmonary disease (COPD) being treated with a metered-dose inhaler, or MDI;

4. FBS ≤ 140 mg/dl; and BP ≤ 140/90 mmhg;

5. Diabetes patients with no clinical complications of the heart, kidney, liver, or other condition exceeding the capacity of Muang Kham PCU to manage; and

6. Diabetes patients with no recurring symptoms of hypoglycemia of unknown origin.

Exclusion criteria consisted of the following:

1.   Diabetes patients receiving insulin therapy;

2.   Diabetes patients having had other serious illnesses;

3.   Diabetes patients having had complications related to DM;

4.   Diabetes patients having a fasting plasma glucose (FPG) less than 130 mg%;

5.   Diabetes patients who are not able to read Thai.

Data were also collected by interview about the health system, management and services in the DHS with persons who influence policy decisions, and staff who provide DM case management for referred cases, including the primary treating physician who referred DM cases to the PCU, three nurses, two public health staff of the Primary care unit (PCU), and four village health volunteers (VHV).

At the time of this study, there were 253 registered DM-only cases in the Tambon. In addition, there were 113 cases of DM-hypertension co-condition. There were 947 cases of hypertension-only in the Tambon. Thus, the total registered cases of DM, hypertension, or DM-hypertension co-condition was 1,313.

Selection of the study area was conducted by purposive sampling with the intention to select an area with a large number of well-prepared PCU with cadres of VHV, and with a clinical team consenting to be part of this research study. Selection was also limited to those PCU with computerized case database systems. Ultimately, of all the PCU reviewed, the Muang Kham PCU best met the above study criteria.

Results

The data presented in this chapter consist of two parts: Part 1 presents the context of the situation, the DHS system and management of the DHS. The second part is a presentation of data on patients transferred to the Muang Kham PCU.

● **Context of the situation, DHS system and management of the DHS**

The data show generally increased numbers of persons screened by year, and detection of cases with risk for diabetes also increased steadily in recent years. Proportion of case detection as a percentage of the target varied from 50% to 70% during the time

period. The detection rate increased in Muang Kham in the last two years when screening exceeded the target. It can be seen that the proportion of persons with risk factors for diabetes declined in the most recent year for the province. At the district level, however, the proportion of persons with diabetes risk increased in the most recent year. About 0.4% of those screened were in the early stage of diabetes (Table 1, Figure 1).

● **Situation of Diabetes Mellitus and Hypertension**

Table 2 shows registered cases of diabetes and hypertension by year for Phan District. There are steady, increasing trends for both of these NCD conditions during 2008-13. When looking at the provincial total the proportion of the mid-year population with diabetes or hypertension is fairly constant. But at the district level the trends are increasing. At the Tambon level the trends for these NCD is constant. The increased caseload is causing a burden and crowding at the local hospital, and increased cost of care (medicines, lab tests, etc.), including cost of travel for the cases. Because many of the cases are elderly, they need to be accompanied by someone else, and this also increases costs and social burden. Thus, a number of cases miss check-up and drug re-supply appointments. Clearly, there is a need to decentralize check-ups closer to the home community, with more community participation in care and monitoring of the NCD cases in their neighborhood.

● **Health System Development of Phan District**

Phan has set up a District Health Board which applies strategy through the network of health outlets (CUP PHAN). Addressing the challenge of NCD is the focus of the One District One Project (ODOP) scheme and the Primary Care Award program to encourage the Tambon Health Promotion Hospitals (THPH) to know the status of their catchment populations and share experience. The following are findings of the system so far:

1.   In the past, there was inconsistency between the data from the THPH and the district hospital and this resulted in uneven coverage and lack of continuity of service. Thus, a new program was developed (J-PINGPONG) to improve the data system for NCD, drawing upon the JHCIS of the THPH, and forwarding these data to the district for analysis and developing

a collaborative plan of treatment. The system of data on community care and referral has also been improved, within and outside the network;

2. There have been challenges regarding capacity building of the THPH staff given the shortage of nurse practitioners in these facilities, and the heavy workload. Sometimes, health technicians have to fill in and conduct exams of patients. Thus, the CBL system was introduced to formalize learning and capacity building as tailored to the local context. The CPG was established for monitoring of the diabetes cases at THPH with practical nurses receiving training as "mini case managers."

3. There is knowledge management to improve staff understanding about comprehensive care, based on principles of family medicine. Case studies of families from home visits to NCD patients are used as a basis of learning and sharing knowledge in a participatory way.

- **Management of NCD Funds in Phan District**

1. Screening of the general population was conducted to identify those at risk, and to provide education to the non-risk and risk populations to prevent development of NCD illness. The PP budget and funds from the Tambon Health Fund were used to locate cases for enrollment in treatment programs and follow-up for the drop-out cases;

2. 2. Care of the patients in the Chronic Disease Clinic and prevention of complications is conducted using funds from the Chronic Disease Fund for annual exams. The primary care facilities and the hospitals are conducting capacity building for staff and applying the J-PINGPONG program.

- **Policies for NCD development in Phan District by Year**

Starting in 2004, a screening program was launched to identify the higher-risk individuals for diabetes mellitus (DM) and hypertension (HT). The screening was conducted in the out-patient department of Phan Hospital. Eligible cases were referred to their local THPH for drug resupply and monitoring. In 2007, a one-stop service policy was launched with special clinics set up for the purpose. Nurses were sent for practical training in managing these clinics. In 2008, a case registration system was set up and, in 2009, the referral system with the THPH was formalized, with

patient cards and referral forms. Annual check-ups were performed at the THPH. In 2010, nurses from the THPH were sent for training in care of NCD patients. By 2011-12 a full registry of cases was established and the data were harmonized between the Tambon and district levels. In addition, a new strategy was introduced to separate cases into three color-coded groups: normal (white), at-risk (light green); and ill (dark green, yellow, orange, red and black, depending on severity). A quarterly report system was set up to track data and progress, but this also placed an increased burden on the staff. Thus, the J-PINGPONG program was developed to reduce the reporting burden and improve the NCD database to plan treatment and follow-up in collaboration among the THPH and the district. Groups of cases were classified as 'only DM', 'only HT,' and 'DMHT.' Nurses were sent for training as 'nurse case managers'. (Figure 2)

- **Transfer of DM clients into the Primary Health Care Unit**

For this analysis, a sub-set of 147 diabetes cases from the Muang Kham Community were analyzed. Most were female between the ages of 56 and 65 years. Most experienced the onset of DM illness at around age 55 years (the youngest reported onset was 20 years). Most were farmers by trade, and two-thirds had completed high school education. Most of the cases did not smoke tobacco and about half still drank alcohol on occasion. Most of the cases had been ill with DM for seven years and had higher than normal BMI (55%). About 10% had below normal BMI. Over two-thirds of the cases had hypertension, two-fifths had high blood cholesterol levels, and one-third had gout. Only 17.7% of DM cases had no co-condition, while 51% had one co-condition, 29% had two co-conditions, and 3% had three co-conditions. Only 3% of the DM cases had ever had hyperglycemia, while less than 1% had ever had hypoglycemia.

Referral of DM cases to the community health center began on January 1, 2011. In 2011, eight (5.4%) of the registered cases did not go to the center for services, while one-fifth of cases had the complete schedule of check-ups every two months. On average, the DM cases attended the center three times in the course of one year. In 2012, only one case (0.7%) did not appear for center services, 5.6% attended all their

two-month check-up appointments, and the average number of DM service episodes at the center increased to four per year per client. In 2013, nine cases (6.1%) did not attend the center during the year and two-fifths attended all their two-month check-up appointments. The average number of DM service episodes at the center increased to five per year per client. In general, the clinician asked the clients to have blood screening done six times a year.

In 2011, a total of three DM cases who were registered with the Muang Kham Community Health Center were referred back to the hospital. The vast majority (98.6%) of cases who were referred to the community center for on-going care did not return to the hospital for diabetes care. In 2012, 17 cases (11.6%) were referred back to the hospital, while 83.6% remained with the Muang Kham Center for care. In 2013, a total of 7 cases (5.1%) were referred back to the hospital, while 79.7% remained under the care of the Community Center. Over time, the number of DM cases seeking care from the PCU has increased.

In 2011, about three-fifths of the 139 registered DM cases received the DTX blood test every time they went to the service site. About one-fifth had normal test results for each test. In 2012, 14.4% of the 146 registered cases received the DTX test at every visit and 5.5% had normal results for each test. In 2013, fully 76.1% of the 138 registered DM cases received the DTX test at every service visit, and 11.6% had normal results for each test. The trend in DTX testing increased significantly in 2013.

In 2011, a total of 139 cases were seen at the local THPH. Nearly all of the DM cases (97.8%) had their blood pressure measured at each visit and virtually all had normal blood pressure. In 2012, the DM caseload at the THPH increased slightly to 144 cases. Fully 95.8% had their blood pressure measured and 70.8% had normal results at each measurement. In 2013, the caseload was 128 clients, 91.4% of whom had their blood pressure measured. One-third had normal blood pressure at each measurement. Between 2011 and 2013, half of the DM cases received HbA1c tests, and one-quarter of these had normal test results at the last time of testing. (Table 3)

Characteristics and the results of the HbA1c test (at last exam). Out of the 75 DM cases who had

the test, most had less than bachelor's degree education and were non-smokers. Notably, proportionately more women than men were likely to have an abnormal HbA1c test result. A 'normal' HbA1c test result was more likely for those between 36-60 years of age. A normal HbA1c result was more likely for those DM cases whose onset of disease occurred in the 20-56 year age group. Those with DM for 2 to 5 years were more likely to have a normal HbA1c result than those with more than five years of illness. Alcohol consumption did not seem to be associated with either a normal or abnormal test result. (Table 4)

Conclusions and Discussion

In the past, DM was mostly found among the elderly. However, at present, age at diagnosis is becoming younger, along with increasing size of caseloads. Globally, DM is increasing, both in developed and developing countries. But the increased morbidity is posing an acute burden on the ability of developing countries to cope with DM, especially given the concentration of cases in the population age 35 to 64 years who are in the prime working ages (International Diabetes Federation, World Health Organization, 2006). This study also found that most experienced the onset of DM illness at around 55 years of age, while the youngest reported onset was 20 years.

When examining the results of the HbA1c diagnostic, this study found that, in 2012, 51% of cases received this test and only 24% had normal test results. This indicates that Phan District has to improve management of Type 2 diabetes to control disease, and to manage cases more efficiently. Due to its multi-faceted nature, diabetes requires a health system that promotes long-term management (International Diabetes Federation, World Health Organization, 2003), not one in which care is provided episodically. Diabetes is not a disease that can be "fixed" at the doctor's office. Encompassing behavioral, psychosocial, and clinical factors, diabetes is one of the only chronic illnesses in which the patient manages the disease on a daily basis, outside of provider control (American Diabetes Association, 2012). The patient is the primary person making the decisions regarding his or her own diabetes care and the patient is the person responsible for successful diabetes case management.

This concept is one that is still in its infancy stage in Thailand. Moreover, it is one that needs to be recognized and accepted by the health care system, providers, and patients.

Care and treatment of Type 2 diabetes should be integrated across many components, and this is a complex endeavor; the focus cannot solely be on blood sugar level. The core goal of care and treatment of DM cases is the efficient prevention of complications. The top priority group for monitoring complications are those cases with heart and cardiovascular diseases. This includes monitoring blood pressure, blood cholesterol, prescribing anti-coagulants, avoidance of smoking, and screening and treatment of coronary heart disease.

Data from 2012 show that control of HbA1c at <%7 among Type 2 diabetes cases has not achieved full coverage, and control is not being maintained. To adequately control diabetes and hypertension, procedures need to be pro-active and coordinated among multiple sectors and levels. This includes the provincial and Tambon administrative organizations, the PCU, village health volunteers, schools, community organizations, and central agencies. There needs to be a joint effort to promote good health of the population, with a family-centered approach to care and treatment, and self-health care maintenance as much as possible. This should include links and referral options (as necessary) to multi-disciplinary treatment teams, and coordination between specialists and general clinicians (Goldhaber-Fiebert, 2010).

The findings of this evaluation are consistent with studies of other forms of NCD case management, i.e., DM cases cannot always control their risk factors. Also, there is another group of cases outside the treatment system who may not even be aware of their risk for NCD, and this could have serious consequences if they suddenly develop complications in the absence of case management. Treatment and rehabilitation then becomes a much more costly and lengthy endeavor. Laboratory diagnostics are also below standard, especially for such measures of micro-albuminuria and creatinine, and this is problematic given the possibility of complications which affect kidney function (Clark et al., 2000). The literature demonstrates that diabetes encompasses behavioral, psychosocial, psychological, environmental, and clinical factors, all of which play a role in the management of

the disease (Zgibor et al., 2004). It is assumed that biological and behavioral characteristics of individuals with diabetes are likely to affect control of risk factors for complications (Bodenheimer, Wagner, & Grumbach, 2002).

Limitations of the Study

1. There remain gaps in the database links for referral of case information between the Tambon and district levels;

2. The quality of the data at the peripheral level is not yet optimal since the heavy workload of the local staff means that they cannot always enter complete and accurate data into the system on all cases. This limits the quality of the data analysis.

The case referral system still lacks a systematic set of procedures. There is also a lack of follow-up of referred cases to see if the referral was successful. Thus, the record-based data on referral is only suggestive and may not reflect the actual situation.

Recommendations

1. Improve the data management system so that there is a unified database for the Phan District Health Office to monitor the status of NCD cases to prevent occurrence of complications by analyzing case profiles and prospective risk.

2. Improve the system of patient care by using the District Health System (DHS) to create an integrated health care system which links the various clinical outlets at different levels. This will reduce gaps and duplication by virtue of an integrated service and management system. In this way, public health problems are approached from a team concept to obtain the most efficient strategies and outcomes, based on the different needs and context of each locality.

3. Conduct more action research to identify improved systems of care for DM cases and achieve fuller coverage efficiently in ways which can be maintained over time.

4. This research is only a preliminary step in the investigation. There should be follow-on studies which compare data across different models of care and health promotion to identify the most cost-effective ways to screen for DM risk in the timeliest way. Risk for complications must be identified in

advance in order to prevent disability. This can be done, in part, by more screening of LDL levels to prevent occurrence of cerebral or myocardial infarction.

Once new models of care and screening are put in place, there should be evaluative research to compare before and after outcomes.

Reference

American Diabetes Association. (2012). Executive summary: Standards of medical care in diabetes 2012. **Diabetes Care, 35**(Supplement 1), S4–S10.

Bodenheimer, T., Wagner, E. H., & Grumbach, K. (2002). Improving primary care for patients with chronic illness. **JAMA, 288**(14), 1775–1779.

Bundhamcharoen, K., Odton, P., Phulkerd, S., & Tangcharoensathien, V. (2011). Burden of disease in Thailand: changes in health gap between 1999 and 2004. **BMC Public Health, 11**(1), 53.

Clark, C. M., Fradkin, J. E., Hiss, R. G., Lorenz, R. A., Vinicor, F., & Warren-Boulton, E. (2000). Promoting early diagnosis and treatment of type 2 diabetes: the National Diabetes Education Program. **JAMA, 284**(3), 363–365.

Goldhaber-Fiebert, J. D., Li, H., Ratanawijitrasin, S., Vidyasagar, S., Wang, X. Y., Aljunid, S., et al. (2010). Inpatient treatment of diabetic patients in Asia: evidence from India, China, Thailand and Malaysia. **Diabetic Medicine: A Journal of the British Diabetic Association, 27**(1), 101–108.

Health Information System Development Office. (2009). Report of the 4th Survey of Health Status of the Thai Population based on Physical Exams: 2008-09. [n.p.].

Institute for Community Health Systems Research and Development. (2009). Proceedings of the technical meeting on primary care services related to the integrated management of diabetes. Bangkok: SahaphanPaisal.

International Diabetes Federation, World Health Organization. (2006). Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia: Report of a WHO/IDF consultation. Geneva: World Health Organization.

International Diabetes Federation, World Health Organization. (2003). WHO, IDF: Screening for type 2 diabetes: Report of a WHO and IDF meeting. Geneva: World Health Organization. ; 2003:54.

Mathers, C. D., & Loncar, D. (2006). Projections of Global Mortality and Burden of Disease from 2002 to 2030. **Plos Medicine, 3**(11), e442.

Ministry of Public Health. (2011). Thailand healthy lifestyle strategic plan 2011-2020. Bangkok: The War Veterans Organizations of Thailand.

Rawdaree, P., Ngarmukos, C., Deerochanawong, C., Suwanwalaikorn, S., Chetthakul, T., Krittiyawong, S., et al. (2006). Thailand diabetes registry (TDR) project: clinical status and long term vascular complications in diabetic patients. **Journal of the Medical Association of Thailand, 89**(Suppl 1), S1–S9.

Task Force on the Study of Disease Burden. (2009). International health policy program: Report of a Study of Burden of Disease and Injury in Thailand. [n.p.].

World Health Organization. (1999). **Definition, diagnosis and classification of diabetes mellitus and its complications: Report of a WHO consultation.** Geneva: World Health Organization.

World Health Organization. (2010). **Global Health Observatory.** Geneva: WHO.

World Health Organization. (2014). **Diabetes mellitus.** Retrieved May 11, 2014, from Available at: http://www.who.int/topics/diabetes_mellitus/en

Zgibor, J. C., Rao, H., Wesche-Thobaben, J., Gallagher, N., McWilliams, J., & Korytkowski, M. T. (2004). Improving the quality of diabetes care in primary care practice. **Journal for Healthcare Quality: Official Publication of the National Association for Healthcare Quality, 26**(4), 14–21.

Table 1 Number of Screening for Diabetes among the Population Age 35 Years or Older by Level and Year

Variable	Chiang Rai					Phan District					MuangKham primary care unit				
	2009	2010	2011	2012	2013	2009	2010	2011	2012	2013	2009	2010	2011	2012	2013
Population	1,193,283	1,195,609	1,123,350	1,096,481	1,283,668	125,153	124,812	122,200	121,755	117,473	7,966	7,993	8,062	8,075	7,838
Target	609,026	580,917	604,509	613,245	613,245	65,570	74,926	72,025	68,423	85,850	4,697	4,585	4,600	4,300	4,200
Screening	479,384	519,243	553,085	560,060	550,983	48,474	59,989	61,270	60,643	60,917	3,530	4,325	4,300	4,525	4,320
Normal	443,873	402,415	402,415	429,220	430,386	31,472	38,739	32,837	38,784	36,094	2,562	3,298	2,973	3,137	3,208
risk	33,232	80,772	92,437	130,840	120,597	2,565	8,316	10,918	376	497	968	1,027	1,327	1,388	1,121
high risk	NA	NA	NA	NA	NA	12,664	11,851	16,481	20,504	24,000	NA	NA	NA	NA	NA
new case	2,188	2,135	674	937	663	1,773	1,083	1,034	979	316	10	11	17	13	15

Source: NCD report, September 2013; Registration of new diabetics, 2013

Table 2 Number of Cases of Diabetes and Hypertension by Year

Variable	2008	2009	2010	2011	2012	2013
Chiang Rai						
DM	NA	25,156	27,344	32,485	34,986	38,041
HT	NA	53,816	56,827	77,749	79,253	88,301
Phan District						
DM	3,185	3,657	4,005	4,413	4,787	5,394
HT	6,516	8,289	9,372	10,406	11,385	11,160
MuangKham primary care unit						
DM	0	0	0	163	169	154
HT	0	0	0	306	302	300
MuangKham Sub-distric						
DM	372	345	365	337	335	332
HT	1,057	1,025	1,065	1,050	1,110	1,084

Source: NCD report, September 2013

Remarks: The proportion of the population with diabetes and hypertension = the number of persons with diabetes and hypertension X 100/number of mid-year population by year

Table 3 Characteristics of Diabetes Cases in Muang Kham Primary Care Unit

Socio-Demographic Characteristics		N=147	Percentage
Sex	Female	105	71.4
	Male	42	28.6
Age group (years)	36-45	6	4.1
	46-55	34	23.1
	56-65	63	42.9
	65 or older	44	29.9
	Mean=61.7,Median=60.0, S.D.= 10.1, Min=36, Max=86		
Age on onset of diabetes	Under 35 years	6	4.1
	35-60	98	66.7
	60 or older	43	29.3
	Mean=56.6, S.D.= 11.1, Min=20, Max=82		
Occupation	General wage labor	17	11.6
	Agriculture/farmer	63	42.9
	Housewife/husband, unemployed	60	40.8
	Volunteer	6	4.1
	Other	1	0.7
Education	None	4	2.7
	Primary	21	14.3
	High school	101	68.7
	Bachelor's	21	14.3
Health status		N=147	%
Duration of condition	under 5 years	23	15.6
	5-10 years	115	78.2
	10 years or more	9	6.1
	Mean=7.1, S.D.= 4.4, Min=2, Max=27		

Table 3 Characteristics of Diabetes Cases in Muang Kham Primary Care Unit (Cont.)

Health status		N=147	Percentage
Body Mass Index (BMI)	< 18.5 (below standard)	15	10.2
	18.5-22.9 (normal)	51	34.7
	23-24.9 (Level 1 overweight)	32	21.8
	25-29.9 (Level 2 overweight)	41	27.9
	30 or higher	8	5.4
Co-condition/ blood sugar level	Hypertension	104	70.1
	High cholesterol	62	42.2
	Gout	5	3.4
	Hyperglycemia	4	2.7
	Hypoglycemia	1	0.7

Table 4 Association between Socio-demographic Characteristics and Result of HbA1c (at last test)

| Variable	HbA1c				Total (Number)	Chi-Square test	p value
	Normal		Abnormal				
	N	%	N	%			
Sex							
female	12	20.7	46	79.3	58	1.54	0.22
Male	6	35.3	11	64.7	17		
Age							
36-60 years	10	27.0	27	73.0	37	0.37	0.55
61-86 years	8	21.1	30	78.9	38		
Age at Disease Onset							
20-56 years	10	25.6	29	74.4	39	0.12	0.73
57-82 years	8	22.2	28	77.8	36		
Duration of Illness							
2-5 years	6	31.6	13	68.4	19	0.8	0.37
Over 5 years	12	21.4	44	78.6	56		
Education							
less than bachelor's	16	23.9	51	76.1	67	0.05	0.94
Bachelor's	2	25.0	6	75.0	8		
Tobacco consumption							
not at present	18	100	57	100	75	-	-
yes	NA	NA	NA	NA			
Alcohol consumption							
not at present	10	23.3	33	76.7	43	0.31	0.86
yes, sometimes	8	25.0	24	75.0	32		

Remarks: Normal HbA1c is ≤7 ,Abnormal HbA1c is >7)
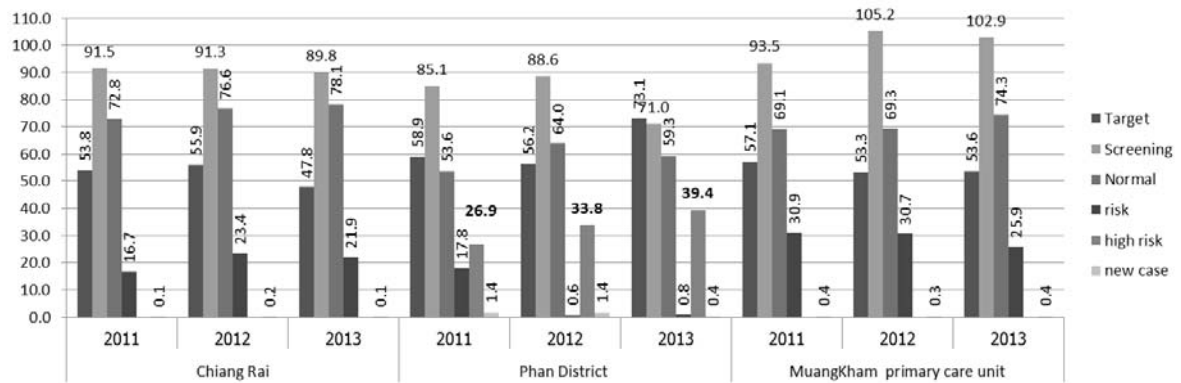
Figure 1 Proportion of Screening for Diabetes among the Population Age =>35 Years during 2011- 13 by Level

Remark

Target proportion = Number of target X 100/ number of mid-year population in each year

Screening percent = number screened X 100/number targeted

Percent screened who are normal = number screened with normal results X 100/number of persons screened

Percent screened who are at risk of diabetes = number screened with at-risk results X 100/number of persons screened

 Percent screened who are at high risk of diabetes = number screened with at-high-risk results X 100/number of persons screened
(only at the district level, risk cases were further classified as those with risk and those with high risk but no symptoms of disease)

Percent screened who have diabetes = number screened with early symptoms of diabetes X 100/number of persons screened
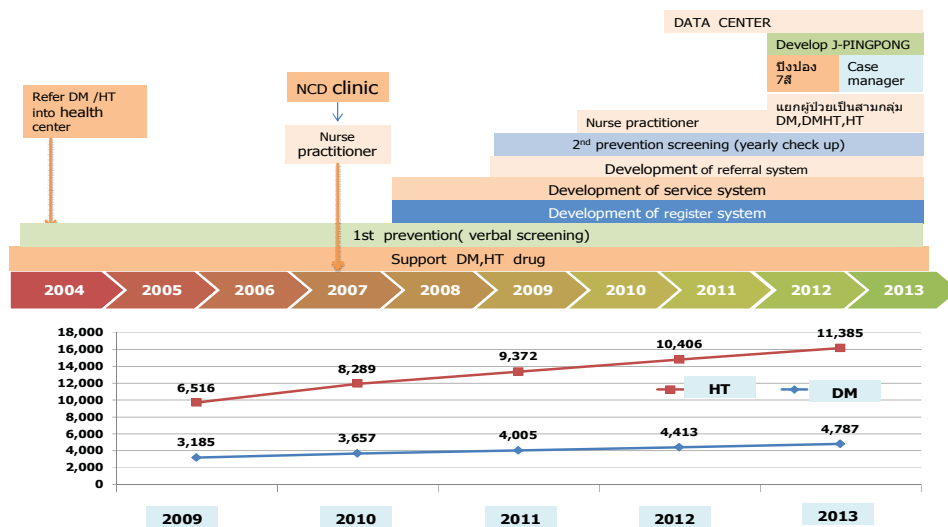

Figure 2 Policies and Measures Related to NCD in Phan District by Year