SATISFACTION OF OXYGEN THERAPY PILOT PROJECT IN TWO DISTRICT HOSPITALS, SAVANNAKHET PROVINCE LAO PDR

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A Thesis Submitted in Partial Fulfillment of the Requirements
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ความพึงพอใจต่อโครงการนำร่องการให้ออกซิเจนเพื่อการรักษาในโรงพยาบาลชุมชน 2 แห่ง แขวงสุวรรณเขต สาธารณรัฐประชาธิปไตยประชาชนลาว

นายศรสวรรค์ พิมมะเสน

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรมหาบัณฑิต
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Thesis Title	SATISFACTION OF OXYGEN THERAPY PILOT PROJECT IN TWO DISTRICT HOSPITALS, SAVANNAKHET PROVINCE LAO PDR
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Field of Study	Public Health
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Accepted by the Faculty of College of Public Health Sciences, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

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ศรสวรรค์ พิมมะเสน : ความพึงพอใจต่อโครงการนำร่องการให้ออกซิเจนเพื่อการรักษาในโรงพยาบาลชุมชน 2 แห่ง แขวงสุวรรณเขต สาธารณรัฐประชาธิปไตยประชาชนลาว. (SATISFACTION OF OXYGEN THERAPY PILOT PROJECT IN TWO DISTRICT HOSPITALS, SAVANNAKHET PROVINCE LAO PDR) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ศ. ดร. ปีเตอร์ ซีนอส, 119 หน้า.

การศึกษาครั้งนี้ มีวัตถุประสงค์เพื่อศึกษาความพึงพอใจต่อ “โครงการนำร่องการให้ออกซิเจนเพื่อการรักษา”ของผู้ดูแลผู้ป่วยที่ได้รับออกซิเจน และบุคลากรในโรงพยาบาล และปัจจัยที่มีผลต่อความพึงพอใจการให้ออกซิเจนเพื่อการรักษา ในสองตำบล จังหวัดสวรรณเขต สาธารณรัฐประชาธิปไตย ประชาชนลาว เป็นการศึกษาเชิงคุณภาพ และเชิงปริมาณ โดยการสำรวจแบบตัดขวาง เพื่อศึกษาความพึงพอใจของผู้ดูแลผู้ป่วยฯ จำนวน 50 ราย การศึกษาเชิงคุณภาพ โดยการสัมภาษณ์เจาะลึก บุคคลกรในโรงพยาบาล รวมทั้งการเดินสังเกตในโรงพยาบาลทั้งสองแห่งเกี่ยวกับการให้ออกซิเจนในโรงพยาบาล เก็บข้อมูลระหว่างเดือน มกราคม ถึง เมษายน 2557 ผลการศึกษา พบว่าร้อยละ 80 ของผู้ดูแลผู้ป่วย มีความพึงพอใจต่อให้ออกซิเจนเพื่อการรักษา ร้อยละ 20 รู้สึกฉยๆ ร้อยละ 38 พึงพอใจต่อการนำท่อใส่จมูกที่นำกลับมาใช้ใหม่ ร้อยละ 24 รู้สึกฉยๆ หากแต่ ร้อยละ 38 ไม่พึงพอใจในเรื่องดังกล่าว พบว่าผู้ดูแลผู้ป่วยที่มีอาชีพชาวนามีความสัมพันธ์กับความพึงพอใจต่อให้ออกซิเจนเพื่อการรักษา, สำหรับบุคลากรในโรงพยาบาล พบว่ามีความพึงพอใจต่อโครงการการให้ออกซิเจนเพื่อการรักษา โดยเฉพาะพึงพอใจต่อเครื่องให้ออกซิเจน หากแต่พบว่าเครื่องให้ออกซิเจนบางครั้งมีปัญหาเรื่องแรงส่งของออกซิเจนและเสียงร้องเตือน จากการสังเกต เครื่องให้ออกซิเจนทุกเครื่องทำงานได้ดี แสดงให้เห็นถึงมีการซ่อมบำรุงดี สรุปได้ว่า ผู้ดูแลผู้ป่วยทีได้รับออกซิเจน และ บุคลากรในโรงพยาบาล มีความพึงพอใจต่อโครงการการให้ออกซิเจนเพื่อการรักษา ในทั้งสองตำบล อันเนื่องมาจากโครงการดังกล่าวมีความคุ้มค่า สนองตอบต่อความต้องการของผู้ป่วยที่มีปัญหาโรคทางเดินหายเฉียบพลันในระยะสั้นที่ต้องการออกซิเจน เช่น ปอดบวม หอบหืด หากแต่ไม่เหมาะสมกับผู้ป่วยที่มีปัญหาเรื้อรัง เช่น โรคถุงลมโป่งพอง ในผู้สูงอายุ เครื่องให้ออกซิเจนทั้ง 10 เครื่องทำงานได้ดี อย่างสม่ำเสมอเป็นประโยชน์ต่อผู้ป่วย หากแต่ควรมีการรักษาความสะอาดของเครื่องอย่างสม่ำเสมอ โครงการการให้ออกซิเจนเพื่อการรักษานับได้ว่าเป็นประโยชน์ควรมีการขยายไปยังตำบลอื่นๆ เพื่อการพัฒนาระบบการให้บริการด้านสุขภาพในประเทศลาวต่อไป

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต .....

ปีการศึกษา 2556 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก .....

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SONESAVANH PHIMMASINE: SATISFACTION OF OXYGEN THERAPY PILOT PROJECT IN TWO DISTRICT HOSPITALS, SAVANNAKHET PROVINCE LAO PDR. ADVISOR: PETER XENOS, Ph.D., 119 pp.

This study aim to describe the satisfaction level of patient's care takers, health care workers and influencing factors related to oxygen therapy in a pilot project in two district hospitals, Savannakhet province, Lao PDR. Qualitative and quantitative methods are used. A cross-sectional study was used to describe satisfaction with patient's care taker. In-depth interviews and walk-through observation was use to describe satisfaction with health care workers. The sample was collected from January to April 2014 and included 50 patient's care takers. The study revealed that overall the majority of patient's care takers were satisfied with oxygen therapy provided by health care workers in two district hospitals with 80% satisfied and 20% with neutral satisfaction. Reused nasal prongs led to dissatisfaction among patient's care taker with 38% satisfied, 24% neutral and 38% satisfied. Among patient's care takers work as a farmer was associated with satisfaction (p-value < 0.05). Health care workers were satisfied with the oxygen therapy pilot project, especially, with the oxygen concentrator, and even with some minor problems with low flow of oxygen and alarm sounds. Through, observation, all concentrators and other equipment were functioning and in good maintenance in the hospital. In conclusion, the oxygen therapy pilot project produced satisfaction among patient's care takers and health care workers in both district hospitals because it provided more benefits such as was cost effective and can provide for all patient needs in short term of oxygen therapy in acute respiratory infection like pneumonia, asthma but don't have long-term of oxygen therapy like COPD in elderly patient. All ten concentrators were functioning and regularly used to provide oxygen to patients but regular cleaning of concentrators was required and the project needs to expand to other district hospitals to improve the health care system in Lao PDR.

Field of Study: Public Health Student's Signature .....

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CHAPTER I

INTRODUCTION

1.1. General Background

1.1.1. Satisfaction

Human satisfaction has variety concepts depend on related to a number of factors such as: past experience, life style, future expectation and the value of both society and individual. The satisfaction is most likely to be described differently by the same person or different people at the different time. In addition, people or patient expectation is according to the presume success of the intervention and other experience on medical care. Certainly, the understanding of how experience affects satisfaction. However, some other few consistent relationships between satisfaction measured and any socio-demographic characteristic, because, diffident group might have different satisfaction, more educated people may apply higher standard in their evaluation of satisfaction, in health care setting, patient might treated in different base on the severe condition, this might lead different satisfaction too (Carr-Hill, 1992)

Satisfaction consists of many theories, have been used to understand the process form satisfaction judgment and theories classified under the three groups: equity, expectancy disconfirmation and attribution. The main goal of the satisfaction process is to compare of what was expected with the service or product. Satisfaction can be control by objective factors (e.g. service features and product) and subjective (e.g. emotion and custom needs).

Satisfaction has been growing interested in quality of health care, especially in patients or consumers. The evaluation of health care services like provincial and

district hospital expect more responsible for patient's requirement (Wijaya, 2011b). Satisfaction and measurement of satisfaction are essential for public health policy analysis, practitioner, health managers and user. The measurement satisfaction can ask user indirectly to rate the quality of services they have received or by their experiences (R crow, 2002). In health care service, satisfaction is the fundamental for the doctor or health care worker in the hospital. Doctor has to serve the needs and wishes of patient. Also work with patient, concern and interest patient (Carr-Hill, 1992)

1.1.2. Oxygen therapy

Oxygen is the gas which tasteless, no smell or color contains 22% of the air. It is the part of people use to breathe then increase the amount of oxygen in the blood, and this element is found in the human body. People cannot survive without oxygen. Oxygen also vital for cell metabolism and in turn, tissue oxygenation is essential for all normal physiological function

Oxygen therapy is the treatment or administrations of oxygen as a medical intervention, which can find in many reasons, both chronic and acute patient care and it is the essence of critical care, also important for body issues. Mostly provide to patient in respiratory distress/failure require oxygen therapy or patient indicate as hypoxaemia with the oxygen saturation (SpO_2) < 90% of oxygen measure by oximeter.

To treat or administrations of oxygen to patient who require is not hard, but need health care worker or doctor indicate or diagnosis with the physical

examination or measure the oxygen saturation (SpO_2), then provide to patient as requirement and appropriate regarding to symptoms and duration, nasal cannula or nasal prong delivers oxygen around 30-35%, when need 100% of oxygen, it may deliver via a tight-fitting face mask or by supplying 100% oxygen to an incubator in the case of infants

Oxygen therapy is simple technique that can seek in the health care facilities in any level by central oxygen system, oxygen cylinder or concentrator, but in Lao PDR, some of them cannot afford even the sample treatment like oxygen therapy, the cases commonly seen in district or health center level in developing countries cause inappropriate case management, because of the fees and costs for drugs and services. The poorest people cannot pay for the cost; therefore, they did not come to the hospital. If, their child will require unspecified days of treatment with a certain drug, particularly oxygen, they will request to leave hospital, although knowing the risks, families often makes a decision to give up expensive treatment. The knowledge and attitude of parents and family member are also importance to recognize and aware how severe and what should their have to take response.(University of Melboune, 2012)

1.1.3. Oxygen concentrator

The first produced of oxygen concentrator was 1974, original designed to provide long-term home oxygen therapy for adult, who has chronic respiratory diseases and now there were many model of concentrator and apply in the bedside in the hospital in developing countries. The concentrator typically weight less than

25kg, it provides reliability oxygen sources for many years long. It can offer oxygen between 5 to 10 liter/minute and it can divides to multiple patients by flow splitter (Trevor Duke, 2010)

Providing oxygen in the clinical uses can either from a cylinder or concentrator, in the past the oxygen cylinder has been more widely used, but for the logistic and cost reason, that why there are not always available of the quantity insufficient, almost in district hospital in developing countries. Compare of the two technologies to provide oxygen is might consider: 1. financial infrastructure to pay for the cost (cylinder cost higher than concentrator), 2. Physical infrastructure for handling and distribution (cylinder need people to carry and distribute to different places). (M.B.Dobson, 2001)

1.1.4. Oxygen therapy Pilot project in Lao People Democratic Republic

Formally the Lao People's Democratic Republic, is landlocked country with 236,800 km^2, locates in South East Asia and has a hot humid climate, with a monsoon season. It shares borders with 5 countries: Thailand, Vietnam, Cambodia, China and Myanmar, has 16 provinces, one capital, 145 districts, population estimated around 6,646 million, density is 27 people per square $kilometer^3$, 1,1 million households, Gross Domestic Product (GDP) per capita in US$ is $9.418 billion in 2012.

Although the Lao People's Democratic Republic implemented good progress of health indicators in the past 30 years, Health outcomes mostly were improved in non-priority district level. However, health's trend not reached the Millennium

Development Goals, mainly maternal and child mortality, from 2000 to 2005, the radio of maternal death had been reduced from 530 to 405 per 100,000 live birth, child mortality had been reduced 107 to 98 per 1,000 per live births(Swiss National Centre of Competence in Research (NCCR) North-South, 2008)

Now, the health sectors of Lao PDR have endeavored to improve and promote by making the policy on health, aims to improve and expand the primary health care service network to the people in the grass root level, especially in the developing zone in remote area approach to health service with appropriate technology that not complicate and not too expensive. The policy itself has been base on the geographic and people, communication and transportation, the size of people being provided to approach the group of remote population, the policy is essential guide. To apply and implement PHC (primary Health Care) policy effectively and sustainability remain a huge issue actively approach, according limited of human resource, equipment and financial. Close coordination and association with other sectors is importance to enlarge PHC activities including good health care service with appropriate technology to determine and diagnosis(Health, 2000)

In order to provide good health care management of acute or severe respiratory infection, especially Pneumonia of children under five year was require early detection of hypoaemia and proper treatment by medicine such as antibiotic and oxygen therapy for life saving

In Lao PDR oxygen therapy is easily provided in the central and provincial hospitals, with central oxygen supply or 7,000 L cylinder, easily refilling with several manufactures available in province and main districts near province. On the other hand, many district hospitals are in rural area and far from main town cannot offer

oxygen to patients even needed, because of unavailable of oxygen, lead cost of oxygen is high due to transportation. Lao PDR does not have universal coverage, any insurance, most hospital pass on cost of treatment to families and patients, between 7 and 52 US$ per day with oxygen, some hospital cost by hour of oxygen provided between 1.5 and 39 US$ per hour. Some district hospital reported that a lot of patients and patient's families discharge hospital early before complete and effective course of treatment because they cannot afforded to pay such a high costs.

After Prof. Trevor Duke had presented a successful oxygen program in Papua New Guinea at the 2nd meeting of the "Regional Clinical Network on Emerging Infectious Diseases" in Manila, November 2010, the clinician working group from Lao, Ministry of Health was interested and requested the assistance of the World Health Organization (WHO) and the Centre for International Children Health (CICH, University of Melbourne, Australia) to conduct the oxygen therapy pilot project in Laos PDR. The international expert team started visit Laos in February 2011, to conducted consultation meeting with many sector of Laos Ministry of Health, clinicians from central hospital and World Health Organization Country Office. The outline of project was planned, and then team down to Savannakhet provincial and districts hospital to have better understood the situation.

The official meeting to launch the project was started in February 2012, among technical staff from central to district level. During the meeting, the 20 priority district hospitals raised up to seek support from the project, finally the project had 10 intervention district hospitals and 10 monitoring district hospitals in 5 provinces, Sekong, Champasack, Savannakhet, Luang Nam Tha and Oudomxay province

1.1.5. Evaluation and measurement

Oxygen therapy is the pilot project in Lao PDR. Therefore evaluation of project is an important material or process to the organization or donor can use to demonstrate its accountability, improve project performance, increase ability for obtain future planning and funds. This can fulfil the objective of organization or donor, by communicate the results of evaluation, then project itself can inform to board of director, service user, the public, funders and other stakeholders about the effectiveness and benefits of the programs in conducting evaluation. Conducting the evaluation has many benefit, it will be a waste of the organization's resources if the result of evaluation are not use(Zarinpoush, 2006).

The evaluation can contribute and provide information for actions example as strategy planning, decision-making, program modification. The evaluation of project helps to understand the success, process, also the effectiveness, it provides you with a comprehensive description of project including: 1. People need to get involved in your project, 2. need project to address, 3. Outcome of project is intended to achieve, 4. Definition of success of your project, 5. Output and Immediate results that you could expect

1.2. Rational

After implemented oxygen therapy pilot project, it ran systematically from central to district level, the project were provided materials and training to health care workers to enhance their capacity. Report of oxygen therapy pilot project was presented during meeting in December 2012, Vientiane. Significant problem occurred

with oxygen concentrator in many hospitals, especially south, where is hot and dusty, even that, many hospitals still require further support, after found the more advantages, such as: patient can easily access to health treatment with oxygen with free of charge, comfortable and easily to use and don't need to refill cylinder from capital city (Gray, 2012), to fulfill the project according of healthcare provider about oxygen therapy by concentrator and satisfaction of health care, because satisfaction is a critical outcome of medical care due to increasing importance on patient as a consumers of services. The questionnaire of patient satisfaction was developed to measure the health care system including facilities and staff (Hays, 1994). The study aims to assess the satisfaction of patient's care taker and health care worker after two year experiences of providing oxygen by concentrators, this information can evaluate the need and the satisfaction to the project also concentrator and health care service on oxygen therapy.

1.3. Research question

- What the level of satisfaction does patient's care taker satisfy on oxygen therapy in pilot project?
- Do the health care workers satisfy on oxygen therapy pilot project?
- Do the health care worker properly use and maintain oxygen concentrators and equipments?
- What are the factors influencing satisfaction of patient's care taker with oxygen therapy?

1.4. Hypothesis

There are associations between general information of care taker, perception/ affordability of oxygen, patient information and oxygen therapy record with the satisfaction of oxygen therapy among patient's care takers

1.5. Research Objectives

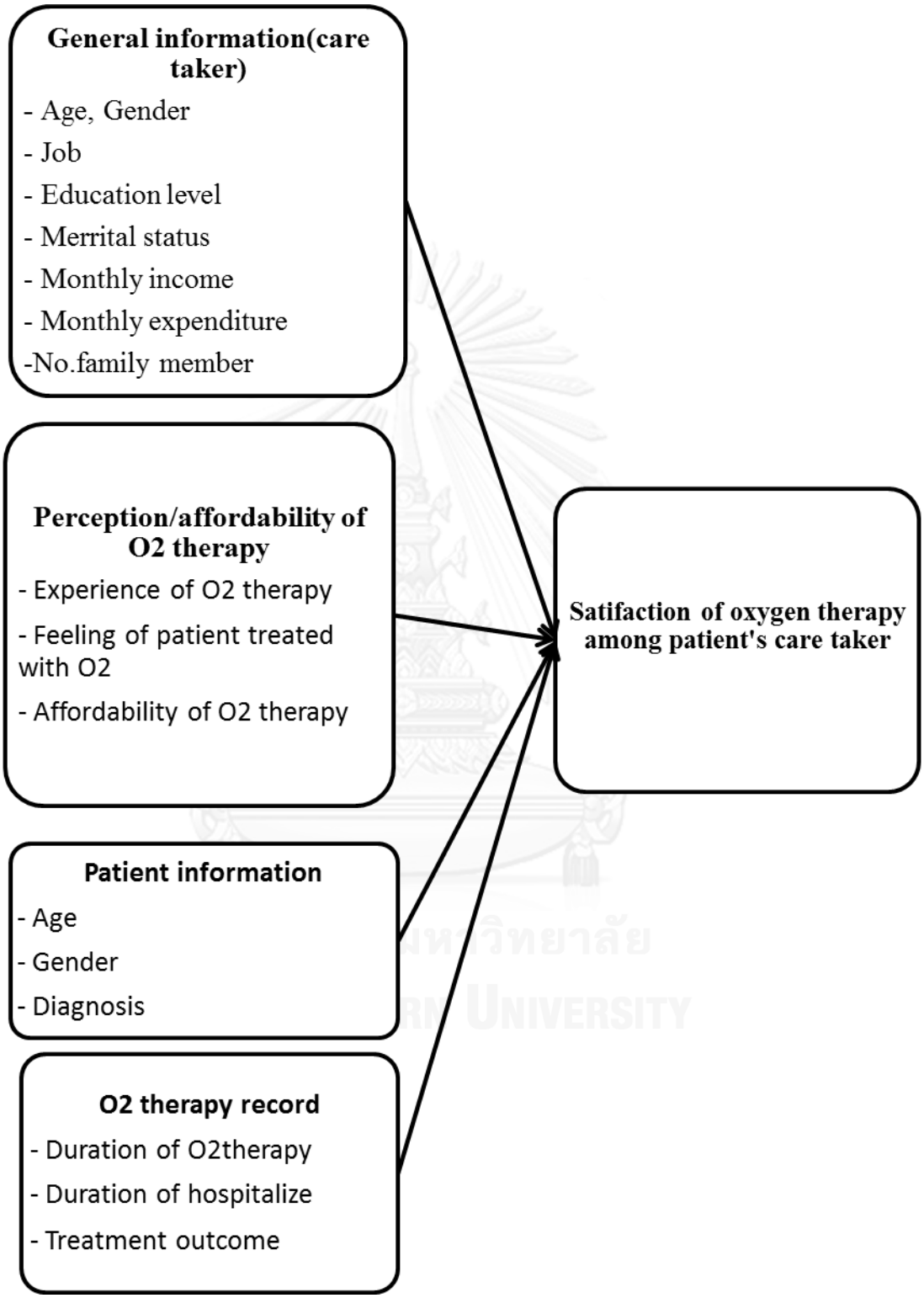
1.5.1. General Objective

- To evaluate satisfaction of oxygen therapy pilot project among patient's care takers and health care workers in Sepon and Phalanxay districts hospitals, Savannakhet province, Lao PDR

1.5.2. Specific Objectives:

- To describe socio-demographic characteristic of patients and patient's care taker who require oxygen therapy
- To describe a satisfaction of the oxygen therapy used with patient's care taker, whose their children or cousins treated with oxygen
- To identify the association of influencing factor and patient's care taker satisfaction
- To describe satisfaction of health care workers with those experience on oxygen therapy pilot project
- To describe the information of usage and maintenance of the equipment to determinant effective use

1.6. Conceptual framework



1.7. Operation definition

- **Satisfaction of patient's care taker:** The term satisfaction means the fulfillment or gratification of a desire, need, or appetite and is the combination between multidimensional concept relating many factors of treatment including experiences with the health care services or health worker, expectation of both technical and interpersonal aspect of care, also needs perceived of the quality of health care
- **Oxygen therapy** or oxygen treatment is the administration of oxygen as medical intervention
- **Patient's care taker**: the one who give physical or emotional care and support during patient admitted hospital
- **Age:** this is the age of patient's care taker who response talking care while patient admit to two district hospital
- **Education level:** the level of education of patient's care takers
- **Monthly income:** the salary or income of patient's care taker earned or received per month include from each number of family membership
- **Monthly expenditure:** the money spend from each member in the household per month
- **Number of family member:** the number of people living together in one house

- **Experience of oxygen therapy:** patient's care taker, relative, children or cousin had experience in oxygen therapy in any hospital from the past two years
- **Feeling of oxygen therapy:** patient's care taker feel with patient who had oxygen therapy
- **Affordability:** patient's care taker can pay for oxygen therapy incase it charges with from oxygen cylinder
- **Diagnosis:** the information from medical record with diagnose patient who admitted and had oxygen therapy by health care workers
- **Duration of oxygen therapy**: the time duration of patient start–stop on oxygen therapy
- **Duration of hospitalization**: the time duration of patient admitted time until discharge from the hospital
- **Treatment outcome**: the outcome of patient symptom before discharge the hospital

CHAPTER II

LITERATURE REVIEW

2.1. Oxygen therapy

Oxygen therapy is the treatment that gives you at the extra oxygen. Our body needs for body function. Typically, our lungs have responsibility to absorb oxygen from the air our breathe but some diseases or condition can prevent from getting enough oxygen such as COPD (chronic obstructive pulmonary disease), pneumonia, heart failure and other diseases, these diseases can cause hypoxemia

Hypoxaemia is the general complexity of infection, mainly acute lower respiratory tract infections. The median prevalence of hypoxaemia in World Health Organization has defined expectations of pneumonia admitted was 13%, but prevalence different broadly. Yearly case of hypoxaemia coincides to smallest amount of 1.5 to 2.7 million in health-care posts. Many of them judge not to admit exploring health at health posts. The significant evidences of oxygen system improvement force on mortality as acute respiratory infection in lacking or limited resources health care facilities. The awareness need to increase of burden of hypoxaemia in babyhood sickness (Lancet Infect Dis 2009; 9: 219–27)

Then the goal of oxygen therapy is to maintain targeted SpO_2 level, relieve hypoxaemia and adequate oxygenation of tissues and vital organs and giving oxygen therapy can reduce the work of breathing

2.1.1. Source of oxygen

Hospitals in Lao PDR including central, provincial and district level, most common source of oxygen are oxygen cylinder and central pipeline. In addition, oxygen concentrators are available in some hospital which provided by projects

Oxygen cylinder is frequency used to provide oxygen to patients whose require. It is produced by cooling air until it liquefied, after that distilling the liquid to separate pure oxygen. This is only the large manufacturing plants can process, because of consuming energy and expensive. Cylinders require transferring to and from the manufactory to refill. It is very difficult, expensive and unavailable in remote area; the small district hospital in the poor area can be without oxygen supplies for the long time

In the bigger hospitals, oxygen supplied through a copper pipes system from a central source of oxygen, typically found outside of the building. The source might be high-pressure gaseous oxygen cylinder, liquid oxygen, a huge oxygen concentrator or maybe combination. In the big hospital they need have oxygen at high pressure in the pipeline system, which capability to be supplied with the gas as at ventilators and anesthetic machine. The copper pipeline system contributes safety and good benefit: it avoids handling, transferring between hospital wards of heavy cylinder and decrease the risk of fire. Nevertheless, it spend high cost to install and maintenance, that not suitable for many district hospital level in remote area

2.1.2. Oxygen concentrator

Oxygen concentrator has a faction to suck an ambient air, which regularly combine 21 % of oxygen, 78% nitrogen and 1 % is other gas. The concentrator extracts nitrogen from air, and then it can produce almost pure oxygen. A lot of concentrators provide oxygen at the level of concentration between 90 – 96 %. At pediatric wards, with reliability and continually power source, four patients can support which one oxygen concentrator but it should connect or use with flow meters or flow splitters that permit oxygen to support to many patients at the same time. To unsure the concentrator proper functioning, it need regular maintenance

Oxygen concentrators function by filter nitrogen from atmospheric air to produce 90% oxygen, it require in tropical country, the purpose for patient use at home for North American and European, some concentrators may not be well suited to use in challenging tropical conditions. The survey was to identify concentrators specified to operate in the heat and humidity of tropical countries and to identify which would be most suitable based also on their cost-effectiveness, energy efficiency, and maintenance requirements. Six of the 11 models surveyed were specified to operate at up to 40°C and 95% relative humidity. The highest ranking models for performance, cost, and energy efficiency were from one manufacturer, AirSep(David Peel, 2009).

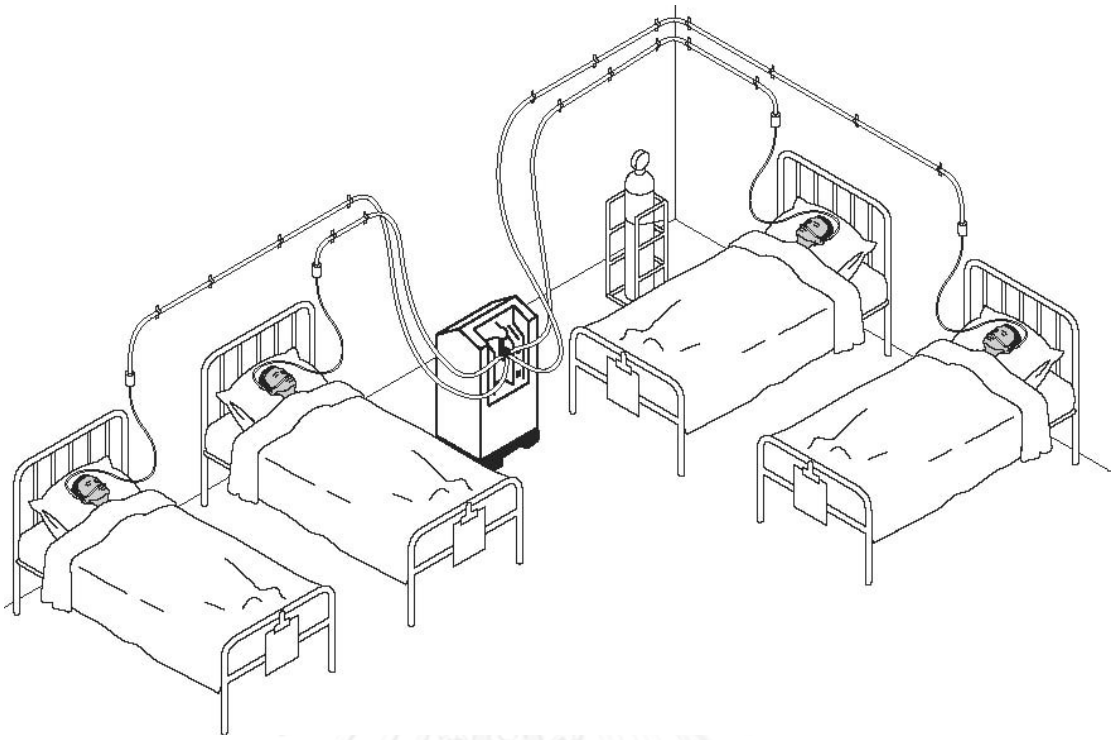


Figure 1: The set up in ward of the concentrator that will deliver oxygen to four patients

2.1.3. Oxygen therapy study

The study of qualitative was conducted with Patient' and nurse' perspectives about oxygen therapy illustrated that. Patients had 5 mains issues of their compliance on oxygen therapy (1) capability to sustain routine activities, (2) comfortable of tools/device, (3) process/technique to optimize compliance, (4) closeness with tool/device, (5) click for changing devices of oxygen concentrator, consider as being mains effective management of oxygen therapy, the variation of perspective on oxygen therapy among patient and nurse show factors that influence on effective oxygen administration. For further research might apply for In-depth understanding of recent oxygen administration practices of patient and nurse factors

that improve or delay effectiveness of oxygen therapy, completed information on patient and nurse factors that force oxygen therapy is going to notify a sound evidence regarding oxygen administration decision of nurse(Eastwood, O'Connell, Gardner, & Considine, 2009)

In Papua New Guinea (PNG), all the wards required oxygen therapy, oxygen is essential of saving life. Improved oxygen system effectively helpful to enhance detection and treatment of patient suffer of hypoxaemia in district and province hospitals, also can reduce pneumonia mortality rate in children more than 35%. The bedside oxygen concentrators in district and provincial hospitals consider as the sample, safe, cost effective and reliable oxygen sources. In the big hospital where do oxygen pipelines exist or the hospital was newly designed. The effective used will be an oxygen generator except at this time the cost much higher than bedside concentrators but make the same quantity of oxygen concentrators (T. Duke et al., 2008)

One study was conducted to describe functioning of oxygen concentrator in two countries with widespread long term use of oxygen concentrator as the primary oxygen therapy for children in pediatric wards in 15 hospital in Malawi and 9 hospitals in Mongolia. And found that the concentrators had been installed for median of 36 months and it was the primary source of oxygen, in Mongolia and Malawi concentrators were functioning with up to 30,000 h of use, but on the other hand, the several concentrators were poorly functioning cause limited of use. According, the concentrators from the different brand made different performance. After years of install can conclude that concentrator still functioning, indicating of widespread use where oxygen resource limited (La Vincente et al., 2011)

2.2. Oxygen therapy project

The oxygen therapy in Laos's initiation in 2011, corroboration with the Lao Ministry of Health, Lao clinicians, center for international children health, University of Melbourne and World Health Organization, the purpose to improve quality of care and reduce the cost of hospitalization for patient requiring oxygen in district hospital. There is the strongly evidence from other countries in district and provincial hospital to reduce a mortality rate according hypoxaemia pulse oximeter are reliable source to determine SpO2, in case of needed oxygen therapy, oxygen concentrator provide an affordable alternative technique to supply oxygen to patient

The project contains of three main components: 1. **Starting if an improved oxygen system in ten district hospital** that were selected in five provinces in Laos, including provided and installed oxygen concentrators and other equipment from project. 2. **Capability building in selected hospital** in order to train how to use and fix, also case management of oxygen therapy project, 3**. Evaluation of the pilot project trai**l, this can help project coordinator to understand the sustainability and feasibility of this approach in Laos. The project integrates with other activities to improve quality of health care, including the introduction of the Lao pocketbook of the hospital care for children. The project have 2 years plan project. If the pilot project is successful, project consider to utilize to other district hospitals

The selected 10 intervention hospitals rose up by national technician group of oxygen, provinces and districts with criteria:

- Poor and have no oxygen supplies and difficulty of getting oxygen

- Had high patients admission with respiratory
- Remote areas where consider as a poverty or poorest people in Laos live

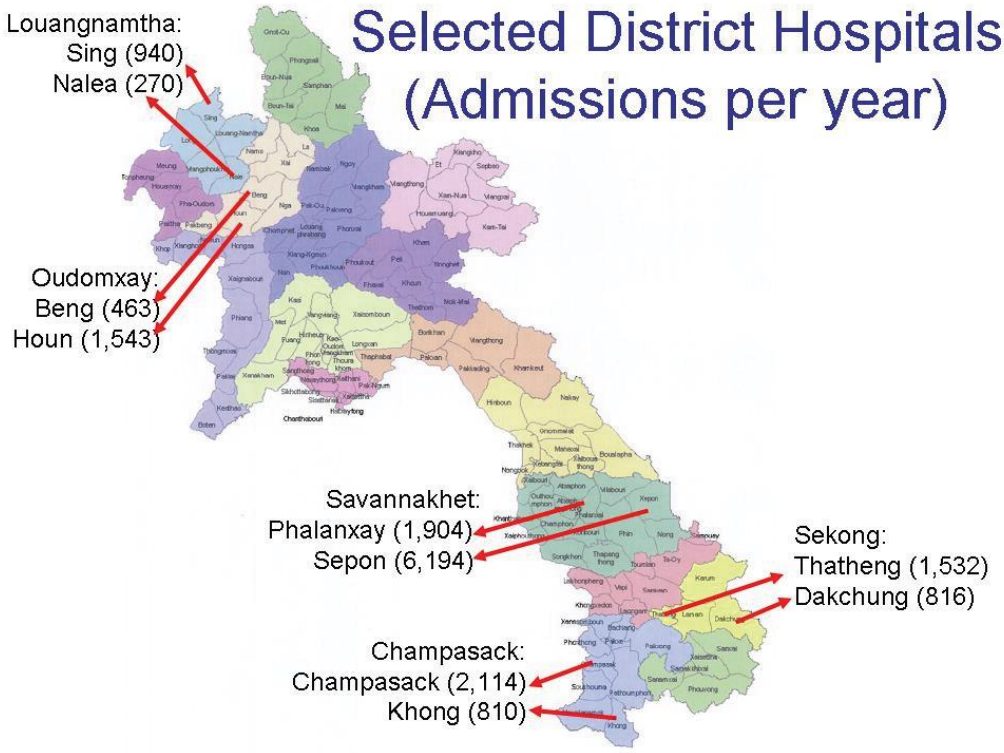


Figure 2 the Intervention of Oxygen therapy pilot project in five provinces, Lao

The intervention district hospitals mean districts were provided oxygen concentrators, material related to oxygen therapy such as pulse oximeter, flow splitter, SpO2 sensor for neonates, children and adult and nasal prongs, the local clinicians were trained on use of oxygen and biomedical engineering and also clinicians had to understood on data collection in order to evaluate pilot trial to understand the sensibility of this approach in Laos and also benefit for patients and cost of care. In the opposite way, monitoring district hospitals were not provided any

equipment or training but had to collect data on oxygen therapy to compare with intervention district hospitals

Figure 3 Oxygen Concentrator

Figure 4 Oxygen Sureflow (flow splitter)

Figure 5 Pulse Oximetry

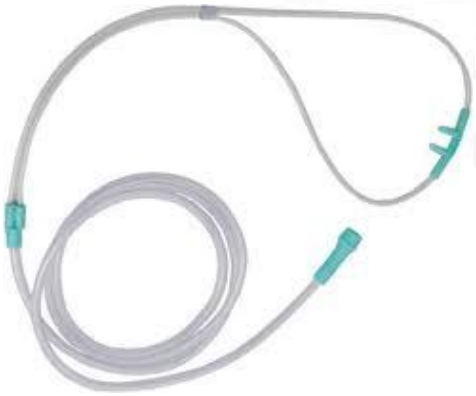


Figure 6 Nasal prong

Figure 7 SpO2 sensor

The aim of project to improve the quality of health care for common illness associated with low oxygen level in blood (hypoxemia) and also to reduce cost or provided the low cost of oxygen therapy in district hospital with free of charge by oxygen therapy with oxygen concentrator. These also support Lao government to reach the Millennium Development Goal 4 “Reduce by two thirds of children under-five mortality rate”. (University of Melboune, 2012)

Implementation place

Savannakhet province is the biggest province of Laos, locate in the southern part, with 15 districts, 1,012 villages, the population is 890,582 people, density is 42 people per Km^2. Sepon mining is the significant biggest in Savannakhet, also Laos for gold and copper(Ministry of Agriculture and Forestry, 2012). Seven out of fifteen districts in Savannakhet province, the percentage of population estimated under poverty line still high(REPUBLIC, 2012). Including Sepon and Phalanxay district

Sepon is 190 km far from capital city of Savannakhet, around 3 or 4 hours travel by private car, not well road construction, variety of ethnic groups, has one district hospital with 6 doctors, 3 medical assistants, 9 nurses and 10 for other staff, more than 4 districts use medical service. This hospital considers a big in that area with 30 beds (24 adult and 6 children beds), total admission was 6194 patients, 3284 adult and 2910 for pediatric. Children admission was diagnosis as pharyngitis/tonsillitis, diarrheal, pneumonia, and gastritis. Adult mostly is pneumonia, gastritis and cold. 10 oxygen cylinders is the main source which require to refill at capital city with high cost of transportation, the average of oxygen cost is around 2.39 $US per day

Phalanxay district is 90 km far from capital city, take around 2 hours by private car, there are a lot of minority groups. The district was provided health care with a small district hospital, including 2 medical assistants, 5 nurses, and 5 for other staff, there are 10 beds available for all patients, total admission was 1904 patients, 1489 adult and 415 pediatrics, most children admit with bronchiolitis, malaria, diarrheal and tonsillitis, adult patients usually admit with malaria, diarrheal and tonsillitis. In the hospital, there had only 2 oxygen cylinders which need refill at capital city, average cost of treatment by oxygen was 30 $US per day

The director of provincial health office and MoH set these two districts to oxygen therapy pilot project in 2012. The project was support 6 oxygen concentrators, one pulse oximeter to Sepon district hospital. Phalanxay district hospital was provided 4 oxygen concentrators and one pulse oximeter. In addition, project provided oximetry sensor probes, Flow splitter, adapter connector, oxygen supply tubing and Prongs

Sustaining oxygen therapy pilot project within district and future extension to other poor districts, project itself have to contribute the good outcome to pilot trails, otherwise, it cannot expand. A proper monitoring and evaluating to find out benefit and satisfaction among people who are involving is important, the functioning of oxygen concentrator and equipment provided consider the main responsibility to evaluate. A few data from last year showed problem according of oxygen concentrator maintenance and showed incomplete of patient's treatment. The problems and outcome of project are interested to identify, otherwise, the project will not success and cannot expand to other district hospital

2.3. Satisfaction

2.3.1. Definition

Satisfaction has been identified in two sample ways: either as an outcome or as a process. The outcome definition characterize as the end state of the result from the experience. Alternatively, satisfaction has been considered as process, emphasizing the perceptual; as the observation the satisfaction has varied refer to their level of specificity, e.g. satisfaction with product, service, performance and consumption experience (Vavra, 1997).

2.3.2. Previous Study on satisfaction

The patients' perspective of health care delivery has been increasing interest to find out how health care system can be better respond to preference and individual need. Subjectivity, expectation and perception are the elements in most definition of patient satisfaction. Patient satisfaction is an important measure of quality of care giving information on the success of health care provider to meet the client expectation and need, and that the absolute outcome achieved in health care, additionally, satisfaction is indicators that useful of health care quality. Then, patient satisfaction with nursing care were conducted to examines the association between individual care and patient satisfaction with general surgical patients (n=1315). Surgical patient stated that the care they receive was only moderately individual overall. A positive correlation between the level of individualized care received and patient satisfaction was found, indicated patient individual nursing care delivery influence patient satisfaction (Suhonen et al., 2012)

A descriptive study with a semi-structured face to face interview was applied with surgical patients in public hospitals in Cypus, to assessment of patients' satisfaction. Overall, patient showed interest with the health care provider (mean=3.97), SD=0.65, R=1-5, particularly, satisfaction with technical aspect of care(mean=4.20, SD=0.62)but less satisfaction with provision of information and hospitalization, most particularly, resting time and food. There is no statistically significant difference in relation to the department, age, gender, education and position; this suggested to health care providers should be aware and more sensitive of important patients' information. Patients' satisfaction measurement should be constant to reformulate the baseline and change the nursing care provision (Anastasios Merkouris, 2013)

To improve quality of care, there are a various approaches, but the quality performance measurements were lacking. Patient and family satisfaction was the empowerment and important tools to evaluate healthcare system (Latour et al., 2009). A life satisfaction and quality of life of patients receiving home oxygen therapy study conducted with 4 scales: 1. activities, 2. physical symptoms, 3. state of health and quality living, and 4. economic status, result showed that, most of the participants visited hospital regularly and had been treated in the hospital during the past three year. A large group of participants were satisfied with life. Life satisfaction was closely related to the patient's hobbies and role and their activities in their communities and family. The mental activity was closely with quality of living and state of health. The economic state was closely related to life satisfaction, quality of living and state of health for these result, activities of patients receiving home oxygen therapy and providing an economic basic for their living consider to be important for improving patient life satisfaction (Tada et al., 2003)

One study was talking about clients' satisfaction toward health care service at the outpatient department in Myanmar, the respondents from OPD were high satisfied(79.7%) as received health care service, medical care available when needed and also the doctor skill. 67.2% were high perception of the goodness of facilities and structure, 52% of participations were high perception for the goodness of doctors and medical staff and other factors that related to satisfaction were income, quality of health facility and accessibility to the health care service($p< 0.05$) (Win, 2010). But in term of general characteristics of the population in this study the clients' age, gender, marital status, education, job were not association with the level of satisfaction. One study found that education, level, length of consultation had been significant with the patient satisfaction (Wijaya, 2011a)

One study was conducted to explore the relationship between experience of patient and people's satisfaction with the health care service, the experience of patient was significant association with health care system, other factor like patient expectation, health status, type of care, and immunization coverage was significant too. 17.5% of observed variations were largely unexplained portion of satisfaction with health care system. Factors external might influence people's satisfaction to health care system than experience of patient.(Bleich, 2009)

2.3.3. Factors associate satisfaction

There are six underlying to patient satisfaction including medical care and information, physical facilities and food, environment, nursing care and visit arrangement (Carr-Hill, 1992). The previous studies confirmed many factors are

related to the patient' satisfaction with consultation, patient characteristic like gender, age, level of education, satisfied (Wijaya, 2011a). other characteristics of satisfaction were: 1. Health improvement or resolution of health problem, 2. Good doctor-patient interaction, 3. Availability of health care, 4.fullillment of prior expectation, 5. Combination of multiple characteristics and 6. Absence of diseases, this refer to the different concept patient have on satisfaction with health care workers as a fundamental (Marcinowicz, Chlabicz, & Grebowski, 2010)

The satisfaction degree in health care system is different widely across countries and time with health care service. Some countries financial and tax are related to the satisfaction in health care system. patient's experiences and expectation, income per capita, technology in health facility are likely to associated with patient satisfaction (Bleich, 2009). Patient satisfaction is consider to include perspective of patient in the process and plan to observation of health care service, the patient perceptions of care and treatment can help and highlight potential reasons for variation in result when satisfaction measures perform (Hudak & Wright, 2000). The quality of health care leading patient to satisfied, because quality is consider as the key of health care performance, also the available of medical care, wherever needed, good health care worker or good doctor in the local hospital (Win, 2010). The satisfaction may due to the individuals' expectation, need and desires such as people or user have limited of knowledge of opportunities and low expectation of service quality, high score of satisfaction might be marked even through poor standard of care have been ensure (murante, 2010)

2.4. Evaluation study

Evaluation is the investigation that systematically of the worth or significant of an object. Evaluation normally consist of some standards, criteria, measure the success, its can identify criteria for successful, lesson learn, thing to achieve, way of moving forward and way to improve

Evaluation of project evaluates activities that are designed to perform a specific mission in the specific time period, this can provide the evidence of successes or failures, give suggestion ways to improves. By a project evaluating, the monitor of the process to ensure an appropriate procedures are in place for completing the project on time and your measure and identify the outcome to achievement and effectiveness of project.

Evaluating and improving the quality of health care provided essential to investigate. Patients' satisfaction is the significant indicator of quality of care, to improve service or patient care in the health facility, the factors influence on patient satisfaction is importance regard to health care workers in the context of health care. The influence factor of patient satisfaction including 8 fields with nursing care: the socio-demographic background of the patients, the physical setting, information and communication, patients' expectations regarding nursing care, involvement and participation, interpersonal relations between nurse and patient, nurses' medical-technical competence, and the influence of the health care organization on both patients and nurses.(Johansson, Oleni, & Fridlund, 2002)

The measurements of satisfaction are important for health care management, public policy analysis, practitioners and users. Measure of satisfaction can use the

technique of indirectly by asking users to rate the service quality their received or reported their experience with health care provider or service (R crow, 2002)

Service quality and understanding satisfaction have been recognized as critical to developing service improvement strategy. The required for patients' satisfaction measurement has been importantly driven by the underlying politics of new public management and concomitant rise in the health consumer movement. The satisfaction of patient being one of the expressed goal in healthcare service, the overall association between patient satisfaction as an evaluation the standard of care versus process of health care, currently, the patient satisfaction of patient in the health sector become increasing widespread, which used to improve the hospital facilities, hospital environment, patient amenities (Gill & White, 2009)

Now, Ministry of Health, Laos has strategy to approaches to primary health care, this aim to provided better status of health and access to the good quality health service accepted by the society with included: 1. Expand and improve access to health care service, 2. Generate equitable access to health care service, 3. Implementing " first priority to prevent diseases and curative, 4. Cooperation of any sector to implement primary health care, and 5. Everyone voluntarily join in the movement for health care (Health, 2000), therefore, oxygen therapy pilot project was consider as primary health care that implement in the district level, to enhance primary care access in the community. It seem that, Lao PDR is lacking the evaluation and measurement of health care service, especially satisfaction from patients who were treated by health care provider, therefore, the trend of policy and strategy focus on infrastructure and capacity building expand in community, on the other hand, the service of health care measurement were limited and become a weak

point, it shows as a few study was conducted to assess quality of health care, facilities and health care providers

Now a day, the trend of health care service in term of treatment is improving compare to the last ten years and the government of Laos had made the progress in effort to achieve the universal coverage(MoH, 2012), but no evaluation and study found regarding of satisfaction or quality of health care service/system. Improving health facilities, and health care service in Lao PDR, still a big challenge, otherwise, patients might seek better treatment from private hospital and go to other countries, for better health care service.

CHAPTER III

RESEARCH METHODOLOGY

3.1. Study areas

The oxygen therapy project had implemented in 10 districts hospital, 5 provinces in Laos, according to the possibility and interest of researcher. This study conducted in Sepon and Phalanxay district hospitals, Savannakhet province, Lao PDR. These district hospitals were intervention hospital of oxygen therapy pilot project that implemented in 201

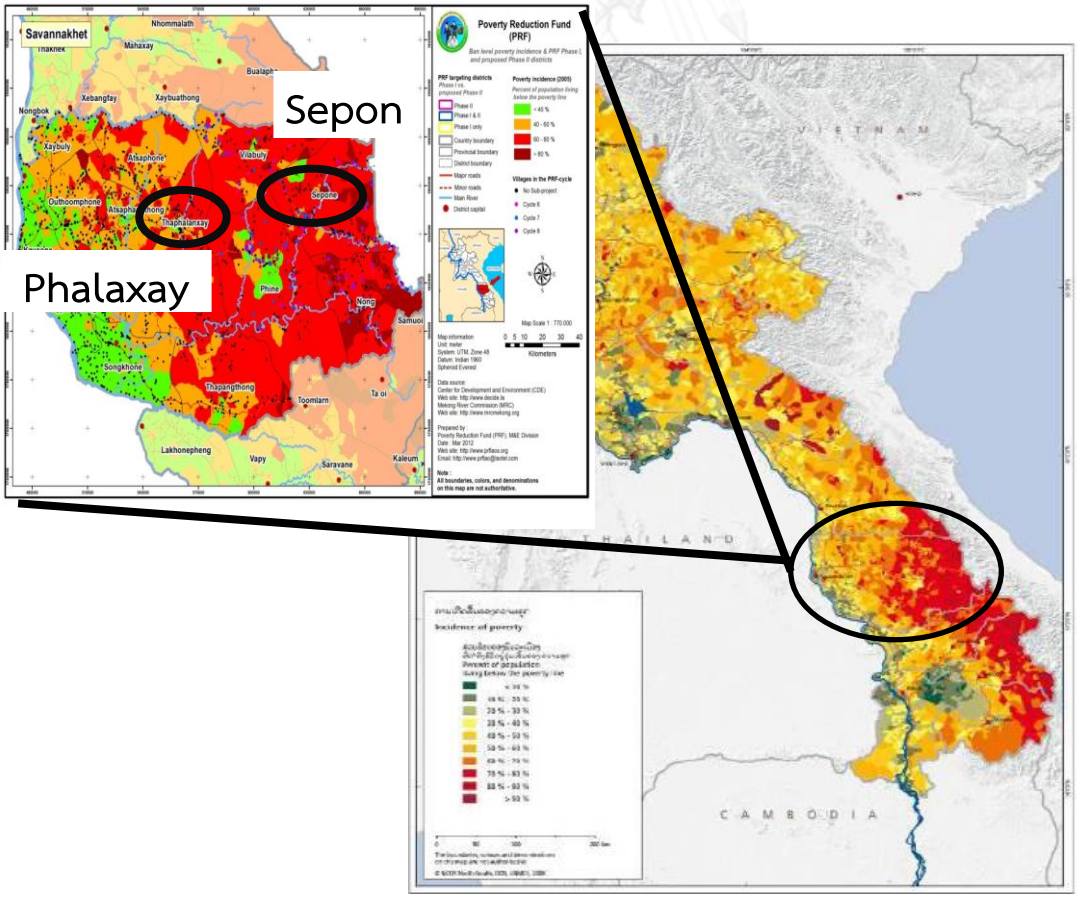


Figure 8: Sepon and Phalanxay district, Savannakhet province, Laos

To evaluate satisfaction of oxygen therapy project, researcher use mix methods: qualitative, quantitative and observation to verify and sort out of the research objectives, because, these three methods can well describe the satisfaction level and provide more detail of information of oxygen therapy pilot project

3.2. Quantitative study design

3.2.1. Study population

The population is target in patient's care taker who their children or relative had oxygen therapy and admitted at Sepon and Phalanxay district hospital

Inclusion criteria apply following as:

- Patient's care takers who always giving care to the patient during admitted district hospital with oxygen therapy
- All patients who are treated by oxygen in district hospital between January and beginning of April 2014
- The main patient's care taker who willing to participant in the interview and provide the answer regarding satisfaction

Exclusion criteria apply follow as:

- The patient's care taker who cannot provide any information regarding oxygen therapy
- Patient's care takers who are not Lao nationality
- Patient has oxygen therapy by oxygen cylinder only

3.2.2. Sample size

The information from report in 2012 and added with health care worker reported in both district hospital, the case admission with require oxygen therapy was around 13 case per month in Sepon and 7 case per month in Phalanxay, therefore, to be sure the sample size fit for statistical analysis, thence, all patient's care taker who their children and relative have oxygen therapy by concentrator is includeก as the sample size

The data collection started in the last week of January to the first week of April 2014, there was 50 patient's care takers were interviewed, the researcher turn backward to calculate to the probability of patient's care taker in this study and we calculate below:

This has 50 patient's care taker for sample size, estimates probability of type I error ($Z_{\alpha/2}$) is 1.64 and allowable error in prevalence is 0.1 and find out probability of patient care taker who satisfied with oxygen therapy is 80% and dissatisfied 20%

This number of patient's care taker still except in 80% of prevalence of satisfaction, this conclude as the 50 patient's care taker still possible and accepted

3.2.3. Sampling technique

In cross sectional study, the purposive sampling method is for select study's area, which consider in Sepon and Phalanxay district hospitals where implemented oxygen therapy pilot project in 2012 and The study population is include all patient's care takers admit hospitals between last week in January and first week of April 2014

3.2.4. Measurement tool

The tool to collect data from patients and patients' care taker

The structured questionnaire is developed to get information in three parts: 1. general information socio-economic demographic of patient's care taker, 2. satisfaction level of patient's care taker on oxygen therapy by oxygen concentrator and 3. Patient medical record which record in medical log book and oxygen monitoring log book, which translates into Lao language. Part 1 and part 2 are collected by face to face interview, part 3 is collected from medical record

Part 1- General information of socio-economic demographic

This part include items of age, gender, marital status, education level, occupational, the member of family, monthly income , household expenditure, the experience of on oxygen therapy, feeling with patient who had oxygen therapy, and affordability to oxygen treatment even expensive

Part 2- satisfaction of patient's care taker with oxygen therapy

This part has 13 total questions with split in to four sections: 1. Satisfied with service provided regarding oxygen therapy, 2 satisfied with health care workers, 3. Satisfied with oxygen equipment and 4. The overall satisfaction of outcome after oxygen therapy, the questionnaire develop as checklist with 5 skills on oxygen satisfaction to see the variety of patient's care takers appreciate on oxygen therapy

Part 3- Medical record on oxygen therapy

This part has 13 total questionnaires, all information get from medical screening from health care workers, in the first day of patient admit, it includes: date and time of admission, patient's age, gender of patient, diagnosis, SpO_2 level before O_2 start, date and time of oxygen start, O_2 source, date and time of stop O_2, last SpO_2 level before stop on oxygen, cost of oxygen treatment (in cases of using both cylinder and concentrator), date and time of discharge, outcome

3.2.5. Data collection

Before the data collection, researcher contracts with Technical Working Group (TWG) from Ministry of Health to evaluate oxygen therapy project, and after the thesis proposal approve by ethical consideration committee, researcher coordinates with health care workers in Sepon and Phalanxay district hospital and request permission of prospective data collection in emergency room, in patient department (IPD), and delivery room.

The data is collected and compiled by trained health care worker by researcher. The data collect for three month to get as much as patients' care taker in to district hospitals

The satisfactions of patient's care taker with health service provided in the hospitals are interviewed by health care workers in each hospital, this can cause information bias as nurse or doctor who taking care them ask and patient's care taker might provide positive information because they will afraid if they provide negative direction of satisfaction it will affect them while in the hospital. Thereby, research

negotiates with health care worker that, before asking them, have to inform that their result of satisfaction will not affect to them and patient on treatment and other, then do friendly to relax them of scare

3.2.6. Data analysis

For the data analysis, Statistical package of Social Science (SPSS) software version 16.0 is used to describe essential information such as socio-demographic characteristic, patient oxygen record in percentage, frequently, Mean, mode, median, maximum, minimum Standard Deviation and In part of the satisfaction, the research will analyze as:

For the satisfaction of patient's care takers questionnaire in part 2 that total 13 questionnaires and the score part describe as below:

Satisfaction		score
○ Strongly satisfied	:	5
○ Satisfied	:	4
○ Neutral	:	3
○ Dissatisfied	:	2
○ Strongly dissatisfied	:	1

Most of questions are in the general and indicate in the positive direction, but one negative question exists in the question 9 about satisfied to use reused nasal prong. Score mark is opposite from positive as:

Satisfaction score

- Strongly satisfied : 1
- Satisfied : 2
- Neutral : 3
- Dissatisfied : 4
- Strongly dissatisfied: 5

All total score from 13 questions are 65 scores for maximum and 13 score for the minimum. Then researcher converts and classifies into 3 level of satisfaction like: satisfied, neutral and dissatisfied.(Suhonen et al., 2012) as detail below:

- Rank between “Strongly satisfied “ and “satisfied” codes as “ satisfied” (the total rank score between 52 to 65 codes satisfied)
- Rank between “neutral” code “neutral” (the total rank score between 27 to 51 codes neutral)
- Rank of “dissatisfied” and “strongly dissatisfied” code “dissatisfied” (the total rank score between 13 to 26 codes are dissatisfied)

And the four parts satisfaction questions include: service provided regarding oxygen therapy, health care worker, equipment/oxygen system and overall outcome of oxygen therapy are also classified and code in three of satisfaction as above explanation.

The chi-square is useful to find out the association between factors influencing satisfaction among patient's care takers with include socio-economic characteristic, perception/affordability, patients' information and O_2 therapy record

As this study has a few sample size, it might cause row and Colum appear with "zero" mark. To deal with this issue, researcher groups some relate answer in one group and analyses statistics

3.2.7. Validity and reliability

For the validity of the tool, the questionnaire is reviewed by expert and consultants of World Health Organization and professor in Chulalongkorn University to ensure the completeness and validity of the questionnaire.

To check the reliability, some part of the questionnaire on patient medical record was used from oxygen pilot project, that have used for two years while project was running and the satisfaction was use standard question than translated by researcher and Health Care working group in Laos, then conducted Pre-testing in hospital in Vientiane capital, the hospital in Vientiane capital was distributed the concentrator and the patient admission look similar in two district hospitals in Savannakat. As the time and patient limited in Vientiane hospital, the researcher only get five patient, which had oxygen therapy and checking for the possibility to used and conduct the study, The reliability can't test before real data collection according limitation of sample size but the researcher uses the 50 questionnaires from the real sample to analyze reliability, got Cronbach's alpha (α) =0.63

3.3. Qualitative study design

3.3.1. Study population

The population in this design is the health care workers who work and be a key person to response oxygen therapy pilot project in Phalanxay and Sepon district hospital, Savannakhat province

Inclusion criteria apply follow as:

- The health care workers who work with oxygen concentrators pilot project
- Health care workers who used and familiar of using oxygen concentrator

Exclusion criteria apply follow as:

- The health care workers and trainee who have worked in district hospital less than 3 months
- Health care worker who not willing to participate

3.3.2. Sample size

The qualitative sample size select 6 health care workers in two district hospitals for in-depth interview

3.3.3. Data collection

The researcher and technical working group from Oxygen therapy pilot project are involved, before starting data collection, the researcher are fairly informal then asks for agreement to be subject of this study, and make health care worker

feel they are taking in the conversation or discussion lather than in a formal question and answer the situation.

The three health care workers in each district hospital are directed interaction with individual on a one to one basic start by using structure interview guideline to have in-depth discussion with health care worker and all information record in recorder, all information are well protect for individual and confidential between interviewer and interviewee

3.3.4. Data analysis

The content analysis uses to describe and understand the big picture of information is a procedure for categorization, is to make sense of data collection and to highlight the important messages, features or finding

3.3.5. Sampling technique

The purposive sampling technique uses for three health care workers from each district hospital, whose involved oxygen therapy project is selected for in-depth interview to explore their experience with patients with on oxygen in pilot project

3.3.6. Measurement tool

The health care workers in Sepon and Phalanxay district hospitals have informal conversational in-depth interview by researcher using semi-structure questionnaire with including general information of health care worker, satisfaction of

oxygen concentrator and satisfaction and benefit of oxygen therapy pilot project, as it contributes the advantage that data is more systematic and comprehensive, then record by audiotape

3.4. Walk-through observation

3.4.1. Measurement tool

To make sure the equipment and oxygen concentrators are good maintenance and function. The researcher uses checklist to observe the usage of the oxygen concentrators, oxygen delivery tubing, oximeter, sensor and nasal prongs

3.4.2. Data collection

Before data collection, researcher inform the objectives to director of district hospital, thence gather with health care worker in district hospital to have walking through observation around the hospital where the oxygen concentrators located, warehouse and other equipment installation place and uses checklist to observation

3.4.3. Data analysis

This design uses content analysis to picture the situation of equipment and concentrator used after 2 years putting in district hospital; these can highlight the important issues, or even the problem in with concentrator

3.5. Ethical consideration

Before researcher starts data collection, Firstly, the research proposal is submitted to the Lao National Institute of Public Health at University of Health Science for approval and permit to study. Secondly, Health sectors at Savannakhet Health Office is informed for approval, then health care personnel at district health office and district hospital involved for further process of data collection by having clearly explanation of data collection technique, propose and target information that researcher need. Thirdly, before interview the subjects are well explain interview's objective and has agreement from subject by sign in front sheet paper named consent form; they can deny any time, if they do not want to participant in this study without any impact on their treatment and life. All information provided by subject has to kept confidentially information and data from them are used only for academic purposes

CHAPTER IV

RESULTS

This chapter presents the result of study in four sections, the analysis separates into two parts, depend on methodology technique with 50 participants from quantitative and 6 participants of qualitative, include walk-through observation in Sepon and Phalanxay district hospital, these result is to achieve the objectives were set.

4.1. Descriptive findings of the qualitative study

The part of the result finding demonstrates the frequency distribution, percentage, mean, standard division, maximum and minimum of the following variables:

- Socio-demographic characteristics of patient's care taker
- General information of Oxygen therapy
- Satisfaction on oxygen therapy
- Patient medical record

4.1.1. Socio-demographic characteristics of patient's care taker

The frequency distributions in this section include gender, age, education level, marital status, occupation, household member, monthly household income and household expenditure shows in **Table 1**. From total 50 participants, 29(58%) participants are Sepon and 21(42%) participants are Phalanxay. 52 percent of patient's Care taker is male and 48 percent is female, majority of age range in

patient's care taker is ≥ 41 years old falling to 38 percent, Mean is 38.32, Mode is 45 year old, standard deviation is 8.55, maximum is 59 year old and minimum is 24 years old. The education level highest percent is in illiterate group 40 percent, second is secondary school is 26 percent. 94 percent of marital status is married. Most of participants are farmer 54 percent and 20 percent is government employee. Household member mostly between 5 and 8 members is 68 percent, mean is 6.02, mode is 5, standard deviation is 2.81, maximum is 21 people and minimum is 3 people. Monthly household income between 1,500,001 to 3,500,000 kip is 38 percent, mode is 3,000,000 kip, Maximum =15,000,000 Kip, Minimum= 50,000 Kip. Household expenditure between 1,500,001 to 3,500,000 kip is 44 percent, mode is 3,000,000 kip, Maximum =8,000,000 Kip, minimum= 50,000 Kip

Table 1 Frequency and Percentage of Socio-demographic Characteristics of Patient's Care Taker

Characteristics		Frequency (%)
Gender (n=50)	Female	24(48)
	Male	26(52)
Age (n=50)	≤ 30	13(26)
	31-40	18(36)
Mean(SD)= 38.32(8.55), Minimum=24, Maximum= 59	≥ 41	19(38)

Education level (n=50)	Illiterate	20(40)
	Primary school	8(16)
	Secondary school	13(26)
	Vocational school	4(8)
	Bachelor's degree	5(10)
Marital status(n=50)	Single	3(6)
	Married	47(94)
Occupation(n=50)	Farmer	27(54)
	Government employee	10(20)
	Business owner	3(6)
	House keeper	5(10)
	Other_____	5(10)
People live in the house (n=50)	≤ 4	10(20)
Mean(SD)=6.02(2.81),	5-8	34(68)
Minimum=3, Maximum=21	≥9	6(12)
Monthly household income	≤500,000	14(28)
	500,001-1,500,000	8(16)
Maximum =15,000,000 Kip ,	1,500,001-3,500,000	19(38)
Minimum= 50,000 Kip	≥ 3,500,001	9(18)

Monthly household expenditure	≤500,000	13(26)
	500,001-1,500,000	10(20)
Maximum =8,000,000 Kip ,	1,500,001-3,500,000	22(44)
Minimum= 50,000 Kip	≥ 3,500,001	5(10)

1.1.2. General information of Oxygen therapy

Perception of patient's care takers is interviewed, this section to illustrate frequency and percentage patient's care taker contain with four questions and the finding concludes below:

Data from **Table 2** shows: 84 percent of respondents and their family member haven't had oxygen therapy in the last two years, only 18 percent answer yes with including 3 children and 5 adult and elderly people. Participants feel safe with patient who had oxygen treatment is 62 percent and 16 percent is worry with patient who has oxygen therapy. In case, expenditure of oxygen therapy is expensive 89.1 percent of participants are welling to have oxygen therapy, and other 10.9 percent cannot afford in case is expensive.

Table 2: Frequency and Percentage of General Information of oxygen therapy

Characteristics on perception of Oxygen therapy		Frequency (%)
Family members/you got oxygen therapy in the last two years(n=50)	No	42(84)
	Yes	8(16)

How do you feeling on patient/your family receiving oxygen therapy? (n=50)	Fear	6(12)
	Safe	31(62)
	Worry	8(16)
	Other_____	5(10)
Do you afford to oxygen therapy even its expensive for you? (n=46*)	Yes	41(89.1)
	No	5(10.9)

*Missing data and patient's care taker did not answer this question

1.1.3. Satisfaction of oxygen therapy

Patient's care taker is a people who stay with patient to help, they are always with patient, therefore, to evaluation, the satisfaction, they consider as a key participant, this section includes 13 questions with four parts, totally score is 65 and the less is 13, all result are present below:

Total participants are 50 people, 80 percent of patient's care takers have the overall satisfied score more than 52 point and only 10 percent has a neutral satisfaction with oxygen therapy service, mean is 54.94, SD is 4.44, mode is 55, minimum is 39 and maximum is 62. **See Tale 3**

Table 3.The overall group satisfaction on oxygen therapy health care service

Satisfaction		Frequency (%)
Satisfaction score Mean=54.94, SD=4.44, Mode=55, minimum=39, Maximum=62	Neutral score= 27 – 51 Satisfied ≥ 52	10(20) 40(80)

In **Table 4** shows 94 % of patient satisfied with process and step before getting oxygen therapy, 72 % satisfies with the oxygen therapy even more than one day of treatment, patient's care taker satisfies with service provided to their children or relative is 92%, the level of satisfaction of information from health care worker is 80%, 96% of patient's care taker satisfies when doctor provides oxygen therapy and 90 % of them satisfies with taking care by health care worker. The old nasal prong was used and 38% of patient's care taker dissatisfies with old one but satisfies with new nasal prong 88%, 94 % of them satisfied with the equipment used to provide oxygen, 96% satisfied with the oxygen system that deliver to bedside. For the symptom and outcome after treatment is 94% satisfies and 96% of them satisfied with overall of treatment with oxygen therapy

Table 4: The level of satisfaction of patient's care taker in oxygen therapy service

How satisfied are you with	Level of Satisfaction			Mean, SD, Min and Max value
	Satisfaction n (%)	Neutral n (%)	Dissatisfaction n (%)	
Service provided regarding oxygen therapy				
1. Process/steps before getting oxygen therapy (e.g. document process...)	47(94)	2(4)	1(2)	Mean= 4.30 SD=0.547, Min=2, max=5
2. Long term(more than one days) treatment to my children with oxygen	36(72)	9(18)	5(10)	Mean= 3.90 SD=0.931, Min=2, max=5
Health Care Workers(HCWs)				
3. Service provided oxygen therapy to my children/relative by HCW	46(92)	4(8)	0	Mean= 4.36 SD=0.631, Min=3, max=5
4. Information were provided before giving oxygen therapy(e.g. HCWs explained the reason why do my child need oxygen therapy)	40(80)	7(14)	3(6)	Mean= 4.00 SD=0.808, Min=2, max=5

5. Doctor provided oxygen therapy to my children	48(96)	1(2)	1(2)	Mean= 4.40 SD=0.639, Min=2, max=5
6. Took care my children by HCWs on oxygen therapy	45(90)	3(6)	2(4)	Mean= 4.32 SD=0.768, Min=2, max=5
Equipment/facility				
7. Reused nasal prong with free	19(38)	12(24)	19(38)	Mean= 3.08 SD=1.275, Min=1, max=5
8. New nasal prong with charge	44(88)	6(12)	0	Mean= 4.32, SD=0.683, Min=3, max=5
9. All equipment related to oxygen therapy supported treatment for patient (oxygen concentrator, nasal prong...)	47(94)	2(4)	1(2)	Mean= 4.20 SD=0.606, Min=2, max=5
10. Oxygen system in patient room is satisfactory	48(96)	2(4)	0	Mean= 4.44 SD=0.677, Min=3, max=5

Quality of treatment/outcome				
11. Oxygen therapy with patients symptoms	47(94)	3(6)	0	Mean= 4.44, SD=0.611, Min=3, max=5
12. Outcome after received oxygen therapy	47(94)	3(6)	0	Mean= 4.54, SD=0.613, Min=3, max=5
13. Satisfaction rate by oxygen therapy	48(96)	2(4)	0	Mean= 4.64, SD=0.563, Min=3, max=5

The satisfaction on service provided regarding oxygen therapy from question 1 to 2, 76 percent of them has score ≥ 8 that mean satisfies. The mean in this part is 8.2, SD is 1.21, mode is 8, minimum is 5 and maximum is 10. The satisfaction of patient's care taker to health care worker mainly equal or more than 16 score is 82%, mean is 17.08, SD is 2.24, mode is 17, minimum is 9 and maximum is 20 score. In the pilot project, the equipment were provided and installed in two district hospital, majority of patient's care taker 60 percent have score more than 16 score, mean is 16.04, SD=1.8, Mode=16, minimum=13, Maximum=20. The last part of the satisfaction question is taking about the quality of treatment 90 percent has score more or equal 12 score, mean is 13.62, SD is 1.58, Mode is 14, minimum is 9 and Maximum is 15, see in **appendix A**

1.1.4. Patient Medical record

This section contains information of medical record, it is recorded from medical log book, also oxygen monitoring log book provided from oxygen therapy pilot project. The aims are to evaluate patient admission, oxygen saturation recorded and duration of hospitalization in two district hospitals. All questions together in this section are thirteen, the findings show below and from **Table 5**:

Most of patient has age ≤ 1 year is 30 percent, mean is 19.21, standard deviation is 23.82, mode is 1 days, minimum is 1 days and maximum is 85 years old. The gender is not different between female and male; 52 and 48 percent. Patient who has oxygen therapy 32 % diagnosis respiratory diseases (pneumonia has 11 cases, severe pneumonia has 2 cases and asthma has 3 cases). Main source of oxygen therapy is from cylinder (94%), 6 % receipt both oxygen from cylinder and oxygen concentrator.

The reason patient stop oxygen therapy is getting better 84% and 14 % from other (this include patient referral to good condition of treatment place). Well recovered from symptom/diseases become highest percentages as 84 percent, 12 percent is transfer patients and 4 percent consider dead. Before patient were given oxygen therapy, the oxygen saturation has to measure, 66 percent of patients is oxygen saturation equal and below 90 percent (WHO threshold indicate, SpO2 ≤ 90%, have to have oxygen therapy), 34 percent SpO2 is equal and over than 91%. The duration of oxygen therapy is measure, mostly, patients on oxygen equal and less than 24 hours is 96 percent, 4 percent receive oxygen between 25 and 48 hours, mean is 4.12, Standard Deviation is 7.63, mode is 2 hours, minimum is 30 minutes and maximum is 42 hours. Duration of hospitalization also measure, 88 percent of

patient is stay equal and less than 24 hours, 6 percent is hospitalize between 25 and 48 hours and other 6 percent treatment in the hospital more than 49 hours.

Table 5: Patient medical record

Patient Oxygen record		Frequency (%)
Patient's Age Group	Age ≤1	15(30)
Mean=19.21, SD=23.82,	Age Between 2-10	10(20)
Mode=1 day,	Age Between 11-20	7(14)
minimum = 1 day,	Age Between 21-30	7(14)
maximum 85 years	Age ≥31	11(22)
Patient's Gender (n=50)	Male	24(48)
	Female	26(52)
Patient Diagnosis	Respiratory diseases	16(32)
	New born	6(12)
	Accident	5(10)
	Beri Beri	4(8)
	Pregnant and delivery	9(18)
	Other diseases	10(20)
Oxygen source (n=50)	Oxygen concentrator	47(94)
	Both (concentrator and cylinder)	3(6)

Why do the patients stop oxygen therapy(n=50)	Getting better	42(84)
	Other: transfer and death	8(16)
Outcome of treatment (n=50)	Well recovered	42(84)
	Transfer/Death in the hospital	8(16)
Oxygen Saturation level before on oxygen		
Mean=89.58, SD=7.12, mode=90, min=57, max= 100	Oxygen Saturation ≤ 90%	33(66)
	Oxygen saturation ≥ 91%	17(34)
Last Oxygen Saturation level after on oxygen		
	Oxygen Saturation ≤ 90%	3(6)
Mean=96.06, SD=15.15, Mode=99, min=0, max=100	Oxygen saturation ≥ 91%	47(94)
On Oxygen	On oxygen ≤ 24 hour	48(96)
Mean(SD)=4.12(7.63), mode=2 h, Min =30 mn, Max 42h	On Oxygen between 25-48	2(4)
	On oxygen ≥ 49	-
Day of admission	Admission ≤ 24 hour	44(88)
Mean(SD)=16.16(40.33), mode=2 h, Min=50 mn, Max 220 h	Admission between 25-48	3(6)
	Admission ≥ 49	3(6)

4.2 Association findings

4.2.1. Association between socio-demographic characteristic and satisfaction

The association between socio-demographic characteristic and the level of satisfaction in patient's care taker both two district hospital analyze by Chi-square test with the significant level ≤ 0.05. The result finds that in the **Table 6**. The association between level of satisfaction and the education, age, occupation of care taker are not significant association with p-value >0.05, level of education (p-value=0.813), age (p-value=0.152), gender of care taker (p-value=0.887), marital status (p-value=0.152), family and cousin have treated by oxygen (p-value=0.678), and the feeling with patient who have oxygen therapy (p-value=0.651)

The significant association between socio-demographic characteristic and the level of satisfaction in patient's care taker is occupation of care taker (p-value = 0.028)

Table 6: Association between Socio-demographic characteristic and level of satisfaction

Socio-demographic characteristic	Count	Level of satisfaction n (%)		p-value
		Neutral	satisfied	
Female	24	5(20.8)	19(79.2)	0.887[a]
Male	26	5(19.2)	21(80.8)	

Single	3	2(66.7)	1(33.3)	0.098[aa]
Married	47	8(17)	39(83)	
Age ≤ 30 year	13	4(30.8)	9(69.2)	
Between 31-40 year	18	1(5.6)	17(94.4)	0.152[aa]
Age ≥ 41 year	19	5(26.3)	14(73.7)	
Illiterate	20	3(15)	17(85)	
Primary school	8	1(12.5)	7(87.5)	
High school	13	4(30.8)	9(69.2)	0.813[aa]
Vocational school	4	1(25)	3(75)	
Bachelor's degree	5	1(20)	4(80)	
Farmer	27	2(7.4)	25(92.6)	
Govt employee	10	2(20)	8(80)	
Business owner	3	1(33.3)	2(66.7)	0.028[aa]
House keeper	5	2(40)	3(60)	
Other	5	3(60)	2(40)	

Income ≤500.000 kip	14	3(21.4)	11(78.6)	
510,000- 1.500.000 kip	8	2(25)	6(75)	0.960[aa]
1,600,000-3,500,000	19	3(15.8)	16(84.2)	
Income ≥3,600,000	9	2(22.2)	7(77.8)	
Expenditure≤500.000	13	2(15.4)	11(84.6)	
510,000-1.500.000 kip	10	3(30)	7(70)	0.873[aa]
1,600,000-3,500,000	22	4(18.2)	18(81.8)	
Expenditure≥3,600,000	5	1(20)	4(80)	
Ever treated O_2	8	1(12.5)	7(87.5)	0.678[aa]
Never treated O_2	42	9(21.4)	78.6)	
Fear	6	2(33.3)	4(66.7)	
Safe	31	7(22.6)	24(77.4)	0.651[aa]
Worry	8	1(12.5)	7(87.5)	
other	5	0	5(100)	

Note: [a] P-value from the Chi-Square

[aa] the P-value from Fisher's Exact Test because 1 cell has expected count less than 5

4.2.2. The association of patient's medical record on oxygen therapy and level of satisfaction

The medical record of patient with oxygen therapy uses to find the association and the result shows in **Table 7**

The association is analyzed and find the factor that not significant includes: the group of diseases is not significant (p-value= 0.498), and the level of SpO2 after on (p-value=0.098), the duration of on oxygen (p-value= 0.073), hospitalization duration (p-value=0.697), and the reason why do they stop on oxygen also not significant (p-value= 0.616) and the outcome before patient discharge hospital was not significant associate with the level of satisfaction (p-value = 0.653)

Table 7: Association between patient information and level of satisfaction

	Count	Level of satisfaction		p-value
Medical record		n (%)		
		Neutral	satisfied	
Respiratory diseases	16	4(25)	12(75)	
New born	6	2(33.3)	4(66.7)	
Accident	5	1(20)	4(80)	0.498[aa]
Beri Beri	4	1(25)	3(75)	
Pregnant & delivery	9	2(22.2)	7(77.8)	
Other diseases	10	0(0)	10(100)	

SpO_2 ≤ 90(after O_2)	3	2(66.7)	1(33.3)	
SpO_2 ≥ 91(after O_2)	47	8(17)	39(83))	0.098[aa]
On O2 ≤ 12h	46	8(17.4))	38(82.6)	
Between 13-24 h	2	2(100)	0(0)	0.073[aa]
On O2 ≥ 25h	2	0(0)	2(100)	
Hospitalization ≤ 12h	39	7(17.9)	32(82.1)	
Between 13-24 h	5	1(20)	4(80)	0.697[aa]
Hospitalization ≥ 25h	6	2(33.3)	4(66.7)	
Why do they stop O2				
Getting better	43	8(18.6)	35(81.4)	
Other (transfer...)	7	2(28.6)	5(71.4)	0.616[aa]
Treatment outcome				
Well recovered	42	8(19)	34(81)	
Transfer/Death	8	2(25)	6(74)	0.653[aa]

Note: [a] P-value from the Chi-Square

[aa] the P-value from Fisher's Exact Test because 1 cell has expected count less than 5

4.3. Qualitative Findings

4.3.1. **In-Depth Interview**

In-depth interview was also included in this research. The study aims to describe satisfaction of Health Care Workers with those experiences on oxygen therapy pilot project in Phalanxay and Sepon district hospital, Savannakhet province, Lao PDR.

The interviewer selected three key staff, the hospital director, a general medicine doctor and a nurse in Sepon district hospital and the hospital director, a chief nurse and a nurse in Phalanxay district hospital and interviewed them. The interview was only researcher

In Sepon district hospital, the interviews were conducted separately with the below interviewees:

- Director of the hospital who is 45 year old, graduated from Master of Public Health from University of Health Science, Vientiane, He has been working as surgeon in the hospital for 11 years, He was a focal point for the oxygen pilot project.
- One General Medical doctor with 4 years working experience in the hospital, She is 33 years old, graduated bachelor degree of medical doctor from University of Health Science, Vientiane and
- A 53 years old nurse (Deputy Nurse), who has 30 years of working experience in the hospital, graduate from the nursing college, Savannakhet province.

In Phalanxay district hospital, the interviews were conducted separately with below interviewees:

- Director of the district hospital, 42 years old, and Bachelor degree in General Medical doctor, University of Health Science, Vientiane, has been working for 16 years in the hospital.
- A head of nurse, also deputy director of the district hospital, she is 55 years old, with 31 years of working experience in the hospital, graduated from nursing college, Savannakhet province and
- A 27 years old nurse, from nursing college, which 7 years working experience in the hospital. She is the focal person in oxygen pilot project.

The semi structured interview questionnaires had 2 parts, one is satisfaction with oxygen concentrator by eight questionnaires and the other is satisfaction with overall project with six questionnaires. These questionnaires were used to guide the interview and the interview was recorded in recorder and in the questionnaires. The conclusions of In-depth interview are summarized below by hospital:

1. **Can you describe the cause leading patient receiving oxygen therapy? How did you decide to provide oxygen to this patient?**

   Sepon district hospital

- Three keys interviewees responded "*respiratory diseases leading patient to require oxygen therapy such as pneumonia and asthma in children and elder people*"

- Two interviewees considered "*measuring oxygen saturation before oxygen provision important, but, sign and symptoms by physical examination also cannot omit*"

- Because, one of them said "*I used oximeter to measure the oxygen saturation level and also examined respiratory symptoms, such as rapid breathing, chest attraction, and cyanosis. I provided oxygen therapy to a elderly patient, whose oxygen saturation was above 95% but, who had severe chest attraction, thereby, we have to combine both techniques*"

- One interviewee said "*First, I looked the patient' severity, took vital sign to report doctor and evaluated the appropriateness for on oxygen therapy by observed symptoms. But both techniques(use oximeter and physical examination of symptoms)should be equally used depending on patent, because, sometime, We had to provide oxygen first, in order to improve patient' symptom quickly then, measured oxygen saturation later*"

Phalanxay district hospital

- Three interviewees stated *"pneumonia, cyanosis, accident or coma from accident; Beri Beri, delivery, and diarrhea in elder people leading patient to be on oxygen. This year, mostly, we found patient in elder people"*

- One of interviewee said that before oxygen therapy pilot project was implemented "*in the past, we consider only symptoms. After we got the oximeter from the oxygen pilot project, it is always used to measure oxygen saturation before physical examination for giving an oxygen*"

- Two other interviewees mentioned that" *although the oximeter exist, but we mostly examed patient' symptom, and, used oximeter after providing oxygen"*

In conclusion:

- the most diseases and symptoms leading patient to require oxygen were pneumonia, asthma, cyanosis and accident, found in children and elder people
- half of interviewees used oximeter to decide whether or not giving oxygen therapy

2. **How do you satisfy the effectiveness of oxygen concentrator after on patient with oxygen?**

Sepon district hospital

- All of interviewees were satisfied with the effectiveness of oxygen concentrators. As observation, cases who received oxygen recovered and, also increased oxygen saturation level(evaluated by oximeter)
- By asking feedback from patients, they also feel better after receive oxygen therapy

Phalanxay district hospital

- Two interviewees were satisfied with the recover and improvement of patients
- However, one interviewee sated "*I am a bit dissatisfied, as, I observed, in severe cases, the cases did not recover after on oxygen with concentrators, I*

had to inform family to change to cylinder and charge money for oxygen therapy. In case they are poor, I had to change concentrator more than two or three times for one patient per day, because I am not sure with the quality of concentrator. That decisions were made by asking patients information(symptoms), but not measuring oxygen saturation, before change to cylinder or change other concentrators"

In Conclusion:

- Five in six of interviewees were satisfied with the result of treatment by concentrator

3. If any problems happen with concentrator. Can you deal with those? Why?

Sepon district hospital

- "*We cannot repair, only way we can do was reporting to the provincial and central level. Regarding to alarm sound, we only change other concentrator and restart concentrator, if it continued alarm, we stopped using and waited for the provincial and oxygen therapy pilot project team to repair*" stated by two interviewees
- "*I don't know anything on repairing, if any problem happen, I reported to a responsible person in district hospital*" mention by one interviewee

Phalanxay district hospital

- All of them cannot, only wait for provincial and central level to deal with problem

In conclusion:

- All six interviewees were not able to fix, because, they were not trained have no skills on repairing

4. **How do you think of using and maintaining oxygen concentrator**?

Sepon district hospital

- The problem is cleaning, there is no cleaner for the oxygen concentrator in the hospital, then, it passed to doctors and nurses. On the same time, they also provided treatment, therefore, they may forgot to cover and clean concentrator surface

- One interviewee said " *it is not difficult to clean, only nurses and doctor clean after they used*"

- Other one interviewee stated "*I don't know how to solve problems, the one I can do it cleans surface of concentrators"*

Phalanxay district hospital

- Two interviewees explained "*it is difficult, dust can damage the concentrator, but dust is in ambience air. Even though the, hospital made covers for the concentrators, staff did not concern and forgot to cover concentrators"*

- *" In addition, it is a small hospital with a few staff, We have many responsibility like IPD, OPD, delivery….Also less concern from staff on cleaning and on maintaining"*

- An Interviewee said "*It is not hard, only cover the concentrators protect from dust"*

In conclusion:

- Two interviewees had no problem of using and maintenance
- Other four interviewees consider regular cleaning difficult for them, because doctor and nurse also had other responsibilities, therefore, no time to clean, also little concerns from health care worker to clean it

5. **How do you satisfy between oxygen cylinder and oxygen concentrator?**

Sepon district hospital

- All three interviewees satisfied oxygen concentrators
- "*Cylinder has to be refilled; the company is far resulting in high cost of logistic. Concentrator can run all the time with cheap running cost and never shortage of oxygen, also, reduce the cost of logistic. On the other side, concentrator produces low flow, mean. We can offer only for patient in IPD, ER and delivery room, but it does not support anesthesia and surgery. In general patient who require oxygen treatment in IPD, ER , oxygen from concentrators can improve oxygen saturation and symptoms as same as cylinder"* one explanation from an interviewee
- *" it can immediately provide to patients after turn on oxygen concentrator, it does not need to put more equipment as cylinder and can give more than one patient by flow splitter"* said by one of interviewee

- Other one interviewee clarified "*It is very hard for me to use cylinder, I had to put and remove oxygen regulator and twist valve. The procedure made loud sound while twisting new oxygen cylinder. I scared to use cylinder since, I was trainee in hospital. That a reason why, I don't want to use it. The quality of oxygen from concentrator is effectiveness to improve patient condition same as oxygen from cylinder*"

Phalanxay district hospital

- Two of interviewees were satisfied and confident with oxygen cylinder better than concentrators "*concentrators always alarm and, produced low flow. Therefore, we don't like it. Sometimes, we had to change patients to cylinder in case we consider the symptoms were not improved*"

- Other one interviewee said "*I am satisfied with oxygen concentrator, I can move it easily and am comfortable to use, but cylinder is difficult to moves, there is concern to refill, on the other hand, concentrator also improve symptoms as same as cylinder*"

In conclusion:

- Four of interviewee satisfied with concentrators. Some of them also concern of the oxygen flow and alarm sound

- Two of interviewee was not satisfied because low oxygen flow and alarm sound

6. How does your patient satisfied and complain while on oxygen with oxygen concentrator?

Sepon district hospital

- One of the key interviewee said "*I had not heard any complain from patient and patient's family. Oppositely, they were satisfied and felt good because of, free of charge; it improved their symptoms and improved breathing. Some cases were happy when doctor on oxygen by oxygen concentrator*"
- One interviewee stated "*In pediatrics, they complained on oxygen lead their child feel difficult. Those who had long term treatment, even required discharge, those cases were mostly found in minority groups*"
- An interviewee mentioned "*In severe case, they complained, oxygen therapy cannot make them feel better, symptoms remaining the same; I thought that they did not feel better because their diseases had not be cured yet. On the other side, some of patients were admitted because they needed oxygen therapy, they even asked doctor to give patient an oxygen, because they saw the improvement of the other patients using oxygen. They cannot find oxygen therapy in private clinic within district. In my experience, I provided oxygen to a case of death on arrival, because family required. The interviewee did not hear any complain from non-severe or mild cases who were provided oxygen*"

Phalanxay district hospital

- Two of them explained " they never heard patient complained, but, we saw, they took off nasal prong, We consider, the prong may cause incomfortability"
- "*In the beginning of installation they complain of smell of the oxygen flow from concentrator, but they no longer smell* " one interviewee said
- One of them remarked "*They complained of alarm sound, because, they never heard. They even said, maybe the case was died because the concentrator was not working well but doctor still provided*"

In conclusion:

- Two interviewees heard patient complain on smell and alarm and other four people never heard

7. **Have your patient requested discharge, when doctor/you told them to on oxygen therapy?**

Sepon district hospital

- All of them said "no one required discharge within 1 or 2 days but after three days, they did. in severe cases, whose were about to die, they also required to discharge"

Phalanxay district hospital

- Three of interviewees haven't found patients required discharge because of oxygen. Most patients and patient's family rely on doctor's decision

In conclusion:

- During the past two years, no case required discharge hospital because of oxygen therapy

8. Do you satisfy with oxygen concentrator?

Sepon district hospital

- Three of them were satisfied with oxygen concentrator
- One of them still concern some problems such as alarm sound, but, the hospital has six concentrators, therefore, they can be working well by changing to a new concentrator or restart

Phalanxay district hospital

- "*For now, I satisfied with concentrator and four of them are sufficient to treat to patient who were admitted*" as said by interviewee
- One mentioned *"it is ok, better than nothing, especially, in poor people who cannot pay for oxygen cylinder"*
- One interviewee stated " *I am a bit dissatisfied because of the flow from oxygen concentrator was low, cause the patient did not recover"*

In conclusion:

- only interviewee was a bit feel dissatisfied six, but In overall of the oxygen concentrator, five of them were satisfied

Overall project

9. How do you satisfy on oxygen therapy project in term of management system, training, monitoring and evaluation?

Sepon district hospital

- "After implementation of the project, we had a training to improve knowledge on case management on oxygen therapy, implemented good monitoring system. When concentrator had a problem, we can report to province and central level. First, provincial team came to fix, and central level took to repaire to Vientiane in case the provincial team cannot fix the concentrators, and then sent it back to the hospital. It is still difficult to record oxygen therapy within district hospital" said by one interviewee
- "The training was good, if the project provided only concentrator without train, We would not know how to use and maintain. The monitoring is also good. In case, problems occurred or any mistakes happened, we can improve, in order to sustain the project" said by one of interviewee
- One mentioned " I satisfied because oxygen therapy pilot project had a good monitoring"

Phalanxay district hospital

- Two main interviewees stated " it is good project, but I was not trained with central level, only explanation from staff in the hospital"
- An interviewee mentioned " I am satisfied with monitoring and training, because it can provide knowledge and staff can know more"

In conclusion:

- All of interviewees are satisfied with the project such as training on cases management using oxygen to health care worker in the district hospital, and the project had a good monitoring and repairing support from central and provincial level

10. What is the advantage and disadvantage of this project for your hospital?

Sepon district hospital

- "the project was advantage because patient can reduce cost of treatment by oxygen. The project provided comfortable concentrators and they are easy to use. The oxygen quality was good and the project provided knowledge" three interviewees had stated
- One interviewees mentioned " Only alarm sound cause I didn't satisfied"

Phalanxay district hospital

- It is good, patient can complete of treatment by oxygen with free of charge

In conclusion:

- Advantage: To save the cost and complete treatment on oxygen, because of free of charge for patient, easy to use, provided good quality of oxygen, provided a training
- Disadvantage: some concentrator had alarm sound

11. Would you satisfy to continue participate (continue report and update situate) of the project or not, even without support?

Sepon district hospital

- "We agreed to continue, even no support, because continue reporting are not hard. Especially, we should continue to report and contract with the province, because they can fix the concentrators" stated by three key person

Phalanxay district hospital

- Three of them agreed to continue reporting and recording depending on the project needed

In conclusion

- Six interviewees were agree to continue provide data to the project coordinator

12. What do you concern or dissatisfy on project?

Sepon district hospital

- Did not have any concern and dissatisfaction within the hospital

Phalanxay district hospital

- One key interviewee specified "*I had two things to concern and dissatisfied. One was repairing oxygen concentrator, mostly, we had to rely on central level, it caused delay of using and repairing, therefore, the spare parts or equipment should be available at provincial level, in case, an oxygen concentrator is broken, provincial staff can come to fix or we can send it to the province for repairing.*

- *"Second, the right persons should be selected for training, otherwise, the trained staff won't respond and monitor if it is impossible to train all staff within the district should "* stated by two interviewees
- The other did not have any concern

In Conclusion:

- Four interviewees did not have any concern and dissatisfaction
- Other two interviewees had a concern on repairing broken concentrator. Most of repairing depends on central level. This caused delay of repair and use. The other concern was selection of right persons to be trained and give responsibilities that will help project sustainable

13. What is your recommendation to improve on oxygen therapy project if we will extend to other district?

Sepon district hospital

- "This project was good, if the project have capacity, you should extend to distant and poor district hospitals, where no oxygen therapy, especially, Nong district hospital, they did not have even oxygen cylinder"
- "Provide more training to update information to old and new staff, also elected the right respondent to work with other project, otherwise the training is useless" one interviewee answered
- Other key one interviewee "Continue support in monitoring and providing prongs. Many poor patients cannot afford of paying prongs and seek for help"

- “Provide more training on repairing and providing materials(guideline and related documents) , in case small problem, we can solve within hospital with, then We can use oxygen concentrators faster”

Phalanxay district hospital

- One interviewee mentioned “ more training to all staff, place concentrator in the right place, to prevent dust, also extend project to other poor district hospital that don’t have oxygen cylinder”
- “I want to recommend to other district hospital that, this concentrator cannot provide 100% of oxygen, but it is good for all the patients who require oxygen therapy” one of interviewee

In conclusion:

- The comments were for extending the project to other poor district hospital, provided more training to old and new staff, continuing supports for nasal prongs and other materials in implementation hospitals

14. Do you satisfy of the oxygen therapy pilot project?

Sepon district hospital

- An interviewee explained“ I was very satisfied, because, the project offered light concentrator and easy to use”
- “ I was proud and strongly satisfied, because, the project provided everything free so that, patients can save their money on oxygen and they were able to pay for other essential elements of their hospital care” one reply

- One interviewee stated “Strongly satisfied because we always have oxygen to provided patient. Oxygen is available through oxygen concentrators in many wards and we didn’t need to move oxygen a heavy cyliner and change oxygen regulator, patient can receive oxygen all the time”

Phalanxay district hospital

- “ it was good to help poor patients and improve patient’ symptoms, oxygen therapy also can reduced case mortality rate in patient who required oxygen therapy” stated by one of them
- Other one interviewee answered “ saving the cost of oxygen treatment, save life and available to all who needed oxygen”

In conclusion:

- All six interviewees was satisfied with project, because, it help a lot in cost saving and improve case management for those who require oxygen therapy

4.3.2. **Walk-through Observation**

A walk-through survey includes in this research, aims to describe the information of usage and maintenance of the equipment, and to determinant effective use, the checklist was designed to apply in two district hospitals

Of the 10 concentrators which had been put into the service, six concentrators were provided to Sepon district hospital and four were given to Phalanxay district hospital. Each hospital should have a visit by a biomedical engineer skilled in oxygen

equipment technology. The visits should determine if the equipment is sufficient for the clinical needs and in good working order

Time used

It is observed that the time of concentrators used in two district hospitals, since project implemented, has a different data from each other.

In Sepon district hospital, the maximum of concentrator used is 6193 hours, minimum is 192 hours, the total used in six concentrators is 10,386 hours, and the average time used is 5193 hours

In Phlanxay district hospital, the total hour of four concentrators used is 1,263 hours, the average time used is 632 hours, the maximum time is 418 hours, minimum is 98 hours

Of the concentrators which have been used for less than 200 hours, it means, the concentrators were used between 4 or less than 4 days per year. These concentrators find in both district hospitals.

Table 8: Oxygen concentrator time used of 10 concentrators in two district hospitals

Hospital	Concentrator Code	Time used(Hour)	Located
Sepon	V5056512	6193	ER
Sepon	V5051580	954	Birth Delivery
Sepon	V5042345	631	IPD Adult

Sepon	V5151659	192	IPD Children
Sepon	V5054990	1215	Post-surgical room
Sepon	V5151632	1201	Mobile machine
Phalanxay	V5042369	418	Mobile machine
Phalanxay	V5151643	349	Mobile machine
Phalanxay	V5055157	398	Mobile machine
Phalanxay	V5151649	98	Mobile machine

Figure 9 Time measurement of concentrator

The external surfaces of the concentrator

The observation find that most of the oxygen concentrator' surface and oxygen outlets are clean in both district hospitals and well protected equipment made to avoid dust such as: cloth-cover and shelve

Figure 10: Protection equipment

Location of Concentrator and Problem

Through walking-survey, the concentrators place in the room, and do not under sun light, but two hospitals locate concentrators differently. In Sepon hospital, five concentrators fix in the room since first implementation, only one spare machine can move to any places depend on treatment requirement. In phalanxay hospital, four of them save in one room and take out when treatment needed

Mostly problems occur to the concentrator in Phalanxay, where dust consider to be a major problem, four of them have alarm sound, two are changed sieve bed

and one fix in Vientiane capital. Currently, problems occur with one machine with alarm sound and it is fixed by central and provincial engineering, while team visited. In Sepon all are functioning. Hospital has to concern and need to be reinforced regular cleaning of concentrator to minimize dust

The report of oxygen therapy project organize systematically, as district to province and province to central level, but most of the problems have not been regularly report to the central engineering team, and there seems to be a lack of understanding about how to notify problems.

Figure 11: Location of oxygen concentrator

Nasal prong and Oxygen delivery tubing

In the beginning of project, we set regulation of reuse nasal prong, to reduce cost of treatment, and project were provided materials to wash, but it seem to be problem, as nurses do not have time, then, the new prongs are used, but still found

reused nasal prong available in the wards in order to provide oxygen to patient without wash or clean

By observation of oxygen delivery tubing, it isn't clean, especially, In phalanxay hospital, the tubing system in the wall have dust, also tubing outlets are contained of dust and bug

Figure 12: Oxygen tubing and tubing outlet

Equipment and Protocols in the hospital

The project provided equipment included nasal prongs, sensors, and tubing, those were saved in clean and dry room. But, in phalanxay, the oxygen flow splitters

installed in patient room, were not well protected and cleaned, dust and bug came inside, cause, the oxygen cannot flow and share through.

Additional of equipment, project also provided training to health care workers and distributed oxygen case management manual, guideline of using concentrator, protocol for using oximeter and pulse oximeter. During observation, only guideline of concentrator used exist in patient's room

Figure 13: warehouse and equipment maintenance

Oximeter and Sensor

Since, implemented project, each district hospital was provided one oximeter to monitoring and scanning oxygen saturation, so far, the oximeters are functioning and available in the reception/scanning section

Each hospital get twelve sensors of oximeters and their sensors are all in working condition by checking with normal people, while observation and SpO2 are within the normal range. However, during the recent monitoring visit, it is also apparent that oximeters in some hospitals are being stored in cupboards, in order to keep them safe and to protect them from damage that could occur with us. This means they are not readily available for when need for patients and therefore are likely to be underused.

Figure 14: Pulse Oxymetry and SpO_2 sensor

CHAPTER V

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1. Discussion

5.1.1. Social demographic and satisfaction

Sepon district hospital is the big hospital in that area, it has a lot of staff and medical materials to provide treatment, that why, more than half of patient come from this hospital. The characteristic of people in rural area, male is the leader of family, therefore, over than half of respondent is male (52%), but not big different among gender in this study. The majorities of care takers have medium age, between 31 and 40, and almost get married

Sepon and Phalanxay is a rural area and far from city capital of Savannakhat province, most people have limitation of education(Ministry of Agriculture and Forestry, 2012), that why the care takers in this study have education level below high school. The main occupation of people in this community is a farmer, leading the monthly household in of patient's care takers are not high, most likely between 1,600,000 to 3,500,000 kip(38%), mean the average diary income is between 53,000 to 116,000kip, compare to the monthly expenditure is between 1,600,000 to 3,500,000 kip (44%), therefore, people in this community still poor, because they don't have good income and people cannot save they money(Ministry of Agriculture and Forestry, 2012) and they also have a big family member cause high expend in each month

Majority of the patient's care taker haven't had an experience on oxygen therapy, but they also have a positive thinking of oxygen therapy, because, they feel

safe and they also consider that it can improve symptoms of illness. One study, on oxygen, it state that oxygen intervention likely to be effective to combat childhood mortality from pneumonia (Catto et al., 2011) but still some of them are fear and worry, because patient who have oxygen, consider to have severe symptoms, but compare satisfaction level, 89.1% of them can pay for oxygen therapy, even, it is expensive, but they can pay because they need patient getting better

While three months of data collection, patients who admit with oxygen therapy have to record in the provided form, mostly the case less than 1 year(30%) have oxygen therapy, from data collection, there is not big different between male and female case(48 : 52%). Additionally, high percentage of oxygen therapy is respiratory diseases and mother who prepare to delivery, as notification on analyses, most patients have oxygen treatment less than an hour and also duration of hospitalization is similar

After the oxygen concentrator provided, patients have oxygen therapy through concentrator (94%), but in the Phalanxay district hospital, the concentrators have a problem, that why they use both cylinder and oxygen concentrator to provide oxygen to patient, as oxygen concentrator is a new technology to deliver oxygen, but it has proved reliable machine, and important of cost-saving, and it can deliver oxygen of 2 to 5 liter per minute and have not found any big problem (JAMES A. LITCH, 2000), in cases of Phalanxay, proper maintenance still a problem, therefore, it might lead to the problem. Anyhow, 84% of them improved of their symptoms and discharge with well recovered (84%).

The study results show that patient's care takers overall satisfy with the service, information, equipment and outcome of oxygen therapy, with show the high

score (maximum= 55 and minimum= 36) that relevance to other study that the patient mostly satisfaction with the technical aspect of health care worker care as the highly ranked, technical quality of care, this patient and care taker focus on the competence providers and their high standard of diagnosis and treatment(John E, 1977). Additional, other study mention, some issue appear that patient to be less satisfied with information is provided in the receptionist and other (Anastasios Merkouris, 2013), the accessibility or convenience also one factor that influence patient or care taker satisfied

Efficacy and outcome of care was a measurement in term of perception in usefulness and helpfulness of medical care providers in specific treatment to improve and maintenance health status(John E, 1977), this study also shows the improvement of patient after receiving oxygen therapy, 84 % of them recover after on oxygen. In the guideline for health care worker (WHO 2010) has threshold indicate as oxygen saturation ≤ 90% have to provide oxygen therapy, but depend on health care worker decision like in this study, 34% have SpO2 ≥ 91%, also have oxygen therapy because, health care worker considered physical examination to be an important to provide oxygen, that benefit for patient to improve their symptoms.

The result of study shows that the occupation of care taker is significant associate with the satisfaction, actually, farmer is the major occupation in this study, compare to the income and expenditure per month, is few to seek good treatment, example: in district hospital is the best of treatment for this group, because, they have not been treated in good places in province or central hospital, therefore, this might influence this group of occupation significant with satisfaction in district hospital,

Other study (John E, 1977) mentioned, the financial, consider an important factor to associate with the level of satisfaction, because patients have to pay for service and treatment, but this project is free of oxygen therapy, also material as nasal prong this might be the reason, why this study could not find the association, in a few study, patient tend to be more satisfied when they have insurance. On the other hand, in people who have well finical, they might consider better facilities and better services, because, in the large size of hospital, services are properly organized,(Win, 2010)

In theoretical of patient and care taker satisfaction, the outcome of treatment after is indicator to reflect the perception of patient's care taker on the health care provider, the result from this study shows the improvement/recover of patient isn't significant associate with the satisfaction (p-value = 0.700), The association between socio-demographic characteristic and the level of satisfaction in patient's care taker both two district hospital analyze and the result from this parts have not present significant, but other studies show the correlated of patient satisfaction and socio-demographic(John E, 1977; Suhonen et al., 2012), example:

- Age: older person is more satisfied than younger people, because, generation of each group might had different of influence factors to satisfaction (RaHMQVIST, 2001)
- Education: the less education seem to be less satisfied with the medical care, because they are less satisfied with the technical quality of care got from health care worker

- Family size: in large families are concern of access and finance in the health care service that relate in the outcome and income of each family
- Marital status: a few studies show, single person may less satisfied compared with married

It can be seen these data of patient's care takers varies in different health facilities, health care service provided or difference expectation of care taker may course is not find association(Win, 2010)

5.1.2. In-depth interview

5.1.2.1. Oxygen concentrator and satisfaction to concentrator

In central and provincial hospital level providing oxygen therapy is consigned by doctor, but in the small hospital especially, district hospital in Laos, nurse also provide oxygen therapy to patient then providing oxygen therapy effectively become challenge also for nurse,

One study conducted with nurses' perspectives on oxygen therapy; they had five mains issues identified from nurse, 1.Therapeutic effect, 2. Issues associated with Compliance, 3. Strategies to optimize compliance, 4.familiarity with device and 5.Triggers for changing oxygen therapy devices, one of interesting point of effectiveness of oxygen therapy is using pulse oximetry and arterial blood gas analysis and maintain SpO2 of ≥ 95% in cardiac patient, and the health care worker in this two district hospitals also measure oxygen saturation to indicate providing oxygen and they use threshold SpO2 ≤ 90% (WHO guideline 2010), but some of them, especially nurse, they provide according symptoms, leading some of

them have oxygen therapy even SpO2 above threshold indicate. other study talks about the accuracy for symptoms and sign in predicting hypoxemia among young children with Acute respiratory infection, this review prove neither single nor combination symptoms and signs have satisfactory in predicting hypoxemia in young children with ARI, some study, pulse oximetry in case management relevant of high cost in the implementation and on-going maintenance cost and limited in small hospitals (L.Zhang, 2012). The guideline from WHO recommends two types of combined sign and symptoms to classify hypoxemia patient requiring oxygen therapy, in poor resources setting where pulse oxymetry is not available, 1. Central cyanosis or incapability to feed or drink when oxygen supply is rare, 2. Central cyanosis or incapability to feed and drink or severe chest indrawing or RR ≥ 70/min or grunting (in young infants) or restlessness, in the area where oxygen supply is ample,

Oxygen concentrator provided benefits to patients and health care workers, therefore, five in six of interviewees satisfied, the result of oxygen therapy project. In Papua New Guinea showed the improvement of using system using pulse oximetry and concentrators are a high cost effective, better quality of health care and also reduce mortality in developing country

Some technical problem happen in Phalanxay district hospital, because concentrator produced insufficient “quality” oxygen to treat patient, that why one of them dissatisfied the result of treatment by concentrator and even some of them have trained to repair for some minor problem but they cloud not fix it, because, no tools and lack of fixing skills

To prevent or minimize problem occur, regular cleaning consider for health cares in each hospital to participant, but still they have many responsibilities on diary

duty, thereby, this issue will take to hospital director to consider finding a good solution. As a dust is the major concern to damage machine. In addition, if the problem occurs, district hospital had to report to provincial or central level to consider fixing it, but as far as, this still a problem

Compared the satisfaction between oxygen concentrator and cylinder, four of interviewee satisfied with concentrators, some of them also concern of the oxygen flow and alarm sound. Alarm was indicator of problems occur to concentrator, because, the frequency of alarm indicated what happened to the concentrator such as

- 1 beep = No power
- 2 beeps = Low O2
- 3 beeps = Low pressure
- 4 beeps = High pressure
- 5 beeps = High temperature
- 6 beeps = No flow

While the training last November 2012 was hold, all engineering learned how to observed alarm and repair according alarm sound,

Two of interviewees were not satisfied because low oxygen flow compare with oxygen cylinder., because the oxygen delivers from cylinder provide 100% (society, 2014) and also provide high pressure. The total cylinders full usually oxygen contain at a pressure of about 13 400 kPa (132 atmospheres or bars, or 2000 psi). When the pressure falls below 800 kPa (8 atmospheres or bars, or 120 psi), the

cylinder is nearly empty, (Organization, 2011), but oxygen concentrator can supply oxygen at the concentration of 90 – 96%, because, it entrains air from the ambience air, which usually contains 21% oxygen, 78% nitrogen and 1% other gases. By extracting nitrogen from the air, they can produce almost pure oxygen (O2=21 x 100%/22= 95%). Most concentrators supply oxygen at a concentration of 90–96% (Organization, 2011; society, 2014). In Nigeria newborn unit and economic appraisal of concentrator effectiveness is reported. its provide 85 to 95% at different flow rates, and met our oxygen needs, and had a huge cost benefit over the oxygen cylinders. The oxygen cost via cylinder for just one patient for a year exceeds the initial capital outlay for a concentrator. The Puritan-Bennett oxygen concentrator has a lifespan of at least 7 years and the free maintenance for 1st 26,400 hours of use, after which some major components might need replacement. (Mokuolu & Ajayi, 2002)

Oxygen cylinders' transportation required large work services because it's heavy. Also, oxygen in a cylinder may be completely consumed during a rescue action. The oxygen concentrators, which enrich the oxygen percentage of ambient air, may free rescuers from carrying heavy oxygen cylinders (Sakaue et al., 2008)

5.1.2.2. Satisfaction to overall project

This oxygen therapy pilot project is satisfied with all of interviewee and contributes a lot of benefit to hospitals and health care worker include cost of refill oxygen cylinder and reduce the worker load to carry and move the heavy cylinder, even some minor problem but it still find the solution. Compare to study in Papua New Guinea, the concentrators are put in province and district hospital, they found

the significant cost effectiveness over 2 years, but the problem is do not have reliability power, same as in Phalanxay hospital (Trevor Duke, 2010)

In additional, The training to staff in district hospital were require with all of six interviewees, this consideration of project and donor to allocate the fund regarding to improve cases management to health care worker.

5.1.3. Walk-through survey

As early of oxygen pilot project, the data collection stared from November 2011 and December 2012, from 10 hospitals in oxygen therapy pilot project, 80% of patient received oxygen from concentrator. Around three quarters of patient in ten hospitals receive oxygen flow less than 5L indicated to use concentrator that a maximum oxygen flow is 5 L. and data from intervention hospital showed(technical report, Amy,2012)

Ten oxygen concentrators set in two district hospital, 7(70%) have no big problem, 8(80%) of them always use to provided oxygen. The average time of use is 1,165 hours, with maximum 6193 hours, this machine places in Emergency room in Sepon, the minimum is 98 hours fix as mobile machine in Phalanxy, but no reason why it uses less than other, may consider of problem of the machine and few case admission. Compare to data from 2012, it shows the total 36 oxygen concentrator, have been set and 22(61%) have no major problem, 17(47%) have been regular used and working without and problem (Amy Gray, 2012)

The total of six concentrators use in Sepon is 10386 hours (433 days), the average time is 1731 hours (73days). In Phalanxay, 4 concentrators are provided to

patient with 1263 hours (53 days), the average used is 316 hours (13 days). Since project have been started in year 2012, the time used present that some machine ware used only 4 days in two past year in Phalanxay and around 8 days per 2 years from one concentrator in Sepon district hospital. The data from 2012, present some machine has a problem, cause less use in this district, less than 4 days of use in a year. It seem dust be a main issue can damage of the concentrators because, the last report also state this problem that why they require regular cleaning of concentrators to minimize dust (Organization, 2011), now, the machine still have some problem, that consider from dust. Around October, 2012, the significant problem have been occurred in many machine, and some part in the concentrator have to be change and fix, so now on, the concentrators were address by engineering from central and provincial level (society, 2014)

All oxygen sensor and pulse oximetry is in good condition and available for needed in the screening area/reception, but the hospital and health care workers should be remind, according the past visited, the report was talking about lack from of oximetry used, because, some of health care worker considered to protect from damage by putting in the cabinet, so, it didn't used why needed (Amy Gray, 2012)

In Malawi and Mongolia, the oxygen concentrator have been installed for 48 and 36 months, it was the priority and be a primary sources of oxygen. After assessed concentrators in Malawi (28/36) and Mongolia(13/25) were functioning with up to 30,000 h od use. However some oxygen concentrator were functioning very poorly despite, so, the concentrator is perform variety depend on different brands from variety manufactories but, after years concentrator were still functioning and

indicating widespread use but the resource should consider for ongoing maintenance (S.F.La Vincente, 2011, Functioning of oxygen concentrator)

As observation and ask on oxygen prong cleaning and disinfecting procedure(WHO, Infection Control), cleaning and disinfecting as recommend from the procedure is difficult for them to implement, because limit of time and, they only discard after use or contaminate with blood or secretion. At the beginning of project, it recommends to record time of nasal prong used but it seems to be difficult to monitor as project plan ether.

Limitation

- The period of study is short leading to have time limitation to study in other intervention district hospitals in Sekong, Champasak , LouangNamTha and Oudomxay province
- The satisfaction of patient's care taker on oxygen therapy is interview by Health care workers in intervention district hospitals, may cause bias or limitation of information provided by patients, because they may worry to provide a negative opinions
- A few admission during three months of study in two district hospitals leading problem for sample size
- the study conducts only two district hospital, therefore the information might not generalize to other six intervention hospital
- In Sepon and Phanlanxay district, there are a lot of ethnical group, most of them are difficult to get information, then missing information and unexpected information from subjects may influence by health care workers

5.2. Conclusion

The study set out to describe satisfaction of oxygen therapy pilot project in Sepon and Phalanxay districts hospitals, Savannakhet province, Lao PDR, with focus in two target group of people, one is patient's care taker, second is health care workers. The reason and motivation to driven this topic because oxygen therapy is a pilot project implemented in Laos, to see the successful and further support to other district hospital, the patient's care taker and health care worker satisfaction and the way how health care worker use and maintenance equipment in oxygen therapy pilot project are an important to complete information to drive and move on of the project. Once, the evaluation satisfaction is an essential to investigate, because, it is the significant indicator to defined the quality of care, to improve the service and care provider

The main empirical finding is the satisfaction of health care worker and patient's care takers are chapter specific and summarize with in respective which to answer the study objectives:

The satisfaction of patient's care taker:

As the result from both district hospital, Sepon has more patient treated with oxygen concentrator, most respondent is male (52%), within 31 and 40, and almost get married 98%, do farming 37% and most of them have been oxygen therapy. The total score of satisfaction is 65 marks for maximum and minimum is 13, the analysis shows the overall satisfaction of patient care taker is 80%, mean that almost of patient's care taker satisfied with the treatment by oxygen. Looking in to each part of satisfaction measurement, first, the satisfied with service provided while patient

hospitalized is 76 % satisfaction, the patient satisfied with health care worker is 82%, the satisfied with oxygen equipment is 60% and 90 % of them satisfies with the result of patient recover after on oxygen. It can conclude that more than half of patient's care taker satisfies with the oxygen therapy

In addition, the study tried to looking for factor influencing satisfaction among patient's care taker, but the result shows not significant association between socio-demographic characteristics, but some factor might see the significant as the occupation, most, likely people in community who had working as farming satisfied to the oxygen therapy in district hospital level. Moreover, The perception on oxygen therapy is not significant influence factor to have high satisfaction on oxygen therapy

The satisfaction of health care workers:

In two districts nurse and doctor can provided oxygen therapy to patient, major of patient receiving oxygen is respiratory diseases in children, interesting point of effectiveness of oxygen therapy is using pulse oximetry to measure oxygen saturation who had SpO2 less than 90%, but health care worker also consider providing oxygen by physical examination, especially nurse, they provide according symptoms, leading some of them had oxygen therapy even SpO2 above threshold indicate, but it also significantly used in district where lacking of oximetry,

All of six interviewees in two district hospitals satisfy because oxygen concentrator provided benefits to patients and health care workers, but the problem can be happen, therefore, basic engineering skill need

Some technical problem happen in Phalanxay district hospital, because concentrator produced insufficient "quality" oxygen to treat patient, that why one of

them dissatisfies the result of treatment by concentrator and even some of them trained to repair for some minor problem but they cloud not fix it, because, no tools and lack of fixing skills, need train to health care worker

But compare to the oxygen cylinder, two of interviewees are not satisfy because low oxygen flow compare with oxygen cylinder, on the other hand, the result is conclude that patient still improve with oxygen concentrator, even it have problem, because, it can provide around 2 to 5 liter per minute,

The overall result from the oxygen therapy pilot project is satisfy with all of interviewees, in addition, its contributed a huge benefit to hospitals and health care worker, especially, cost of oxygen treatment, increase accessibility of oxygen therapy to patient, this reflect to reduce mobility and mortality of patient who needed oxygen therapy, also cost of refill oxygen cylinder and reduce the worker load to carry and move the heavy cylinder,

The maintenance and use equipment:

The oxygen was the main source of oxygen in this pilot project, thence, it is an important to evaluate and observe in two district hospitals, then, after the observed, 10 concentrators have different of hour use in phalanxay and Sepon district hospital, because, the maximum hour use in Sepon is high in all 6 machines, the maximum of concentrator used is 6193 hours, minimum was 192 hours, the total used in six concentrators was 10,386 hours, the average time used is 5193 hours. In Phlanxay district hospital, the total hour of four concentrators used is 1,263 hours, the average time used is 632 hours, the maximum time is 418 hours, and minimum is 98 hours. The concentrators surface are clean and have protected equipment of dust but the sure flow splitter in Phalanxay hospital has dust, due to lacking regular cleaning in

the hospital. The concentrator located not under sunlight to protect the high temperature of machine

Other equipment like nasal prong, almost ran out of stock because, it isn't reused and do not wash, By observation the tubing of oxygen delivery, it isn't clean, especially, In phalanxay hospital, the tubing system in the wall had dust, also tubing outlets are contained of dust. And the other thing, oximetry and SpO_2 sensors all of them are functioning and use regularly

The overall conclusion can state that the oxygen therapy pilot project is very useful and effectiveness intervention in Sepon and Phalanxay district hospital in combating with diseases and patient' symptoms who require oxygen therapy, this can minimize and reduce case morbidity and mortality, especially, patient under five year old and this study also showed that this age group is a major group leading to have oxygen therapy with possible potential diseases, it was possible to sustain and implement oxygen therapy project to other district hospital, especially, in the remote area, where limited and absence of oxygen therapy

Benefit of the Study

This study has a lot of benefits; first of all, it can help researcher to know the processes and steps of being a good researcher, in order to set up the plan, taking study process, these knowledge and experiences can improve and strength researcher capacity in future studies

The outcome from this study, even, has a limitation on generalize, but, it also reflect to problems have occurred in the period so patient or care taker' satisfaction

is an important indicator to evaluate, then district hospital can improve their service from the findings

For the project, this outcome will show the level of patient' satisfaction on health care service on using oxygen concentrator and the opinion of health care worker on satisfaction of pilot project. This can help project to improve the problem during the implementation period and create process for next round of project by using some of result from this study, otherwise, the extension and expanding of oxygen project will contribute less satisfaction and benefit

The outcome also benefit for health care system from top to down management system (vertical system), because, lacking survey/study of health service on patient or care taker satisfaction, this leading, poor quality of health care service and still be a problem, patient opinion is valuable, because, they are a consumer, if they are not satisfied, they will find better service from other place or other countries, therefore, this outcome will contribute good contend on oxygen therapy pilot project

A new research may interesting more on satisfaction on health care service and health care provider, because, worldwide have been seriously consideration on patient' satisfaction become a big issue in health care system, as the other developing country, they provided very good health care service to patient, leading more patient seek treatment, even they have to pay a high expend on health service.

5.3. Recommendation

The recommendation comes up with short and long term recommendation according to the time series

5.3.1. Health care worker

The result of this study indicate patient's care taker satisfied and have a positive thinking of health care worker, however, the evaluation of the patient' satisfaction is an important issue to improve the service within district hospital because in term of health care service is the principle for health worker to improve service and make patient feel better, then they would seek treatment in that hospital

Also the satisfaction to the project by health care worker conclude as very satisfaction with pilot phrase, but the problem still be found with the oxygen concentrators, thence, some of health care worker felt bit dissatisfied, therefore, district have to report regularly of problem and situation of concentrator to have a quick response from central and provincial level

The information record still has a problem, cause, lacking of information provided to the pilot project, so, the health care worker needed to put effort and coordinate within the hospital to have a good data collection

Regular cleaning consider as important to protect dust through machine and protect of damage, therefore, require health care worker to have a regular cleaning of oxygen concentrator, equipment, oxygen tubing and oxygen outlet, otherwise, the problem continually happen and cause malfunctioning to concentrators, cleaning is

not hard to do but need time contribution because, most of doctor and nurse already busy with care provided

5.3.2. District hospital

Districts hospitals are a places of implementation of pilot project, the outcome from these hospitals can reflect the situation of project, currently, hospital tried the best to sustain and maintain project in the positive direction, but as we found the problems have been occurred during the past two years, then, organize regular maintaining and report to provincial and central level, need to be improve in the hospital, lead to have a rule or guideline creation by district hospital director, this can help to improve coordination and good monitoring from high level

data collection consider as important to determine the impact on patient care and outcome of on-going project, without data collection, project cannot interpret the result and won't see the benefit of pilot project, if hospital can complete data reflect to extend project to other district hospital, this will help to improve health care system in province and Laos, but as the district have a limit of health care worker, that why it become to director of district hospital to find the solution to solve this problem

5.3.3. Oxygen pilot project and donors

After, the face to face discussion with health care workers in both district hospitals, most of them satisfied with the project, also oxygen concentrators,

therefore, further continue support other district hospitals, it is the priority to project to consider, especially in poor district hospital and far from oxygen refill company

As concentrator still have problem with dust to damage the machine, if, project can find other oxygen concentrator which suitable for Laos where is hot and a lot of dust. Also continue support the existing district hospital, in term of coordination to the oxygen concentrator company to support more spare pare and any problem relate o machine

Pilot project has high expenditure, more donors need to involve, if we need to extend to control and other district hospitals

5.3.4. Ministry of Health

Ministry of health might find more donors and coordinate with other agency to support and expand oxygen therapy by concentrator to other poor district hospital by making report and present this outcome of project during meeting

Now a day, satisfaction of patient with care service or health care facility is an important issue to improve health care system in Laos, but it seen that, we still limit of study to indicate on how best health service had provided to patient or care takers, so, MoH has to allocate fund to university of health, health facility or health institution to study on patient' satisfaction and also to make policy or regulation to improve satisfaction of health care service

5.3.5. To the next study

This study has few sample size only 50 patient's care taker collected during January to April 2014, because during that period few patients admitted to the hospital. Therefore, next study has to find out more patients and do more in other district hospital

The study of patient or care taker satisfaction on oxygen therapy was rare, and very difficult to find the literature review, especially, in Laos PDR. This study was first study in Laos according of satisfaction on oxygen therapy, but it was useful to know the patient opinion of health care service in Laos, by the way, this study also has a limitation small sample, may not generalize to other district hospital, further research has to find out more solution to get more sample size to generalize

The results of this study showed, patient's care taker have the high satisfaction of oxygen therapy but lacking information of association factor that will contribute to high satisfaction, so next research instrument especially some ideas of the questions should evaluation for developing a good question that support to measure patients' satisfaction. There were some issues that need to be improved to make the evaluation nearer to the reality of opinion and to measure the service to improve the patients' satisfaction

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APPENDICES

APPENDIX A

Table of satisfaction

Table 9: Satisfaction scale on health service regarding oxygen therapy with patient's care taker

Satisfaction		Frequency (%)
Service provided regarding oxygen therapy, Question 1 to 2 Mean=8.2, SD=1.21, Mode=8, minimum=5, Maximum=10	Dissatisfied score ≤ 4 Neutral score = 5 – 7 Satisfied Score ≥ 8	- 12(24) 38(76)
Health Care Workers(HCWs) question 4 to 7 Mean=17.08, SD=2.24, Mode=17, minimum=9, Maximum=20	Dissatisfied Score ≤ 9 Neutral Score= 10 – 15 Satisfied Score ≥ 16	1(2) 8(16) 41(82)
Equipment/facility, question 9 to 12 Mean=16.04, SD=1.8, Mode=16, minimum=13, Maximum=20	Dissatisfied Score ≤ 9 Neutral Score= 8 – 15 Satisfied Score ≥ 16	- 20(40) 30(60)
Quality of treatment/outcome question 13 to 15 Mean=13.62, SD=1.58, Mode=14, minimum=9, Maximum=15	Dissatisfied Score ≤ 6 Neutral Score 7 – 11 Satisfied Score ≥ 12	- 5(10) 45(90)

APPENDIX B

Questionnaire of oxygen therapy pilot project

Satisfaction of patient's care taker on oxygen therapy in oxygen therapy pilot project

Hospital_____Province_____Interview_____

date/Month/year_____

Part 1: General information of a patient's care taker (the interviewee)

1. Sex

   1. Female 2. Male

2. Age _____

3. Education level

   1. Do not study 2. Primary school 3. Secondary school

   4. Vocational school 5. Bachelor's degree 6. Other_____

4. Marital status

   1. Single 2. Married 3. divorced 4. Widowed

5. Occupation

   1. Farmer 2. Government employee

   3. Private sector employee 4. Business owner

   5. House keeper 6. Retired person

   7. Other .....

1. How many people live in your house ..... People

2. Monthly household income ..... Kip

3. Monthly household expenditure .....Kip

4. Have your family members/you got oxygen therapy in the last two years?(if answer “No” go to question 11)

    1. No

    2. Yes Who 1. _____when _____how many time_____

    2. _____when_____ how many time_____

    3._____when_____how many time_____

5. How do you feel about patient/your family receiving oxygen therapy?(can answer more than one)

    1. Fear 2. did not feel anything 3. Safe

    4. Anxious 5. Worry 6. Other_____

12. Do you afford to oxygen therapy even its expensive for you?

    1. Yes 2. No

Part 2: Patient’s care taker satisfaction on oxygen therapy (current patient admitted to district hospital

How satisfied are you with	**Level of Satisfaction of oxygen therapy**				
	Strongly satisfied 5	satisfied 4	normal 3	Dissatisfied 2	Strongly dissatisfied 1
Service provided regarding oxygen therapy					
1. Process/steps before getting oxygen					

therapy (e.g. document process...)					
2. Long term(more than one days) treatment to my children with oxygen					
Health Care Workers(HCWs)					
3. Service provided oxygen therapy to my children by HCW					
4. Information were provided before giving oxygen therapy(e.g. HCWs explained the reason why do my child need oxygen therapy)					
5. Doctor provided oxygen therapy to my children					
6. Took care my children by HCWs on oxygen therapy					
Equipment/facility					
7. Reused nasal prong with free					
8. New nasal prong with charge					
9. All equipment related to oxygen therapy supported treatment for patient (oxygen concentrator, nasal prong...)					
10. Oxygen system in patient room is satisfactory					
Quality of treatment/outcome					
11. Oxygen therapy with patients symptoms					
12. Outcome after received oxygen					

therapy					
13. Satisfaction rate by oxygen therapy					

Part 3: Patient Oxygen record

1. Age
2. Sex 1. Male 2. Female
3. Date and time of admission ...../...../..... Time.....
4. Diagnosis .....
5. SpO2 on before O2 stared.....
6. Date of O2 start...../...../.....Time of O2 stared .....
7. Oxygen source
    1. Oxygen concentrator
    2. Cylinder
    3. Both (concentrator and cylinder)
8. Date of O2 stop ...../...../.....Time of O2 stop.....
9. Why do the patients stop oxygen therapy
    1. Getting better
    2. Patient want to stop
    3. Discharge hospital without improving
    4. Discharge hospital with little improvement but no fully recovered
    5. Concern about the payment of O2 therapy

6. other .....

10. Last SpO2.....

11. Cost of oxygen therapy in case of using cylinder and other relevant oxygen therapy .....

12. Date of discharge...../...../..... Time.....

13. Outcome of treatment

    1. Well recovered
    2. Unwell/expected death(patient request to discharge)
    3. Death in the hospital
    4. Transfer , please specify where _____
    5. Other .....

APPENDIX C

Interview guideline

Satisfaction of oxygen therapy pilot project using in district hospital, Savannakhet province among health workers

Hospital_____ date/Month/year_____

General information of interviewee

1. Age .....
2. Sex.....
3. Graduation level.....
4. Job title.....
5. Working experience ..... years

Oxygen concentrator

1. Can you describe the cause leading patient receiving oxygen therapy? How did you decide to provide oxygen to this patient?
2. How do you satisfy the effectiveness of oxygen concentrator after on patient with oxygen?
3. If any problems happen with concentrator. Can you deal with those? Why?
4. How do you think of using and maintaining oxygen concentrator?

5. How do you satisfy between oxygen cylinder and oxygen concentrator?
6. How does your patient satisfied and complain while on oxygen with oxygen concentrator?
7. Have your patient require requested discharge, when doctor/you told them to on oxygen therapy?
8. Do you satisfy with oxygen concentrator?

Overall project

1. How do you satisfy on oxygen therapy project in term of management system, training, monitoring and evaluation?
2. What is the advantage and disadvantage of this project for your hospital?
3. Would you satisfy to continually participate (continue report and update situation) of the project or not, even without support?
4. What do you concern or dissatisfy on project?
5. What is your recommendation to improve on oxygen therapy project if we will extend to other district?
6. Do you satisfy of the oxygen therapy pilot project?

APPENDIX D

Monitoring of the engineering aspects of an oxygen program

Each hospital should have a visit by a biomedical engineer skilled in oxygen equipment technology. At such visits the following tasks should be performed to determine if the equipment is sufficient for the clinical needs and in good working order

Hospital.....

Date of visit.....

Engineer.....

The concentrators should be tested for performance

Concentrator Code Time	1	2	3	4	5	6
Are the external surfaces of the concentrator clean?(Y/N)						
Are the concentrator oxygen outlets clean? (Y/N)						
Does the concentrator usually contact to the sunlight (yes/No)						

Have any concentrators malfunctioned? ☐ Yes ☐ No How many (code)?.....   Do you report, If the concentrators/equipment malfunctioned? To whom? .....

Is all the oxygen delivery tubing clean?	☐ Yes ☐ No
Is the nasal prong clean?	☐ Yes ☐ No
Does the equipment store in clean and dry place?	☐ Yes ☐ No
Are protocols for the use of oxygen concentrators and giving oxygen available on the wards?	☐ Yes ☐ No

The oximeters and sensors should be checked

How many oximeters do you have? How many oximeters are malfunctioning now? Indicate, If the oximeters are malfunctioning ..... And where do you store the malfunctioning?	....
How many sensors were provided initially to the hospital? How many sensors are working now?	....

Check each oximeter on yourself, is the SpO2 within normal range? Describe any problems.....	
Is there a protocol for use of pulse oximetry available on the ward?	☐ Yes ☐ No

Comment on any problems or strengths.....

APPENDIX E

ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ

ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນະຖາວອນ

ໜັງສືສະເໜີ

ຮຽນ:ທ່ານຫົວໜ້າກົມການສຶກສາ ແລະ ຄົ້ນຄວ້າວິທະຍາສາດ.

ເລື່ອງ: ຂໍອະນຸມັດລົງເກັບກຳຂໍ້ມູນ ສຳລັບປົດວິທະຍານິພົນ ໃນຫົວຂໍ້: ການວັດລະ ດັບຄວາມເພິ່ງພໍໃຈ ກ່ຽວກັບໂຄງການທົດລອງການປິ່ນປົວດ້ວຍເຄື່ອງກັ່ນອົກ ຊີ ໃນໂຮງໝໍເມືອງ ຂອງ ແຂວງສະຫວັນນະ ເຂດ, ປະເທດລາວ.

ອີງຕາມ ຂໍ້ຕົກລົງ ຂອງ ລັດຖະມົນຕີວ່າການກະຊວງສຶກສາທິການ ແລະ ກິລາ ສະບັບເລກ ທີ 1808/ ສສກ.ກມ, ລົງວັນທີ 17 ພຶດສະພາ 2013.

ອີງຕາມ ໃບອະນຸມັດດ້ານຈັນຍາທຳແພດ ຂອງ ມະຫາວິທະຍາໄລ ວິທະຍາສາດ ສຸຂະພາບ ສະບັບເລກທີ 062/13.

ອີງຕາມ ໜັງສືຕອບຮັບ ຈາກ ມະຫາວິທະຍາໄລ ຈຸນລາລົງກອນ ສະບັບເລກທີ 0512.78/E /0580, ລົງວັນທີ 19 ເມສາ 2013.

ຂ້າພະເຈົ້າ, ດຣ. ສອນສະຫວັນ ພິມມະສິນ, ເປັນນັກສຶກສາປະລິນຍາໂທ ສາຂາບໍລິຫານສາທາ ລະນະ ສຸກສາດ ສັງກັດມະຫາວິທະຍາໄລ ຈຸລາລົງກອນ ປະເທດໄທ (College of Public Health Sciences Chulalongkorn University, Thailand), ຂໍຖືເປັນກຽດ ຮຽນສະເໜີມາຍັງທ່ານ ເພື່ອຂໍ ອະນຸມັດລົງເກັບກຳຂໍ້ມູນ ສຳລັບປົດວິທະຍານິພົນ ໃນຫົວຂໍ້: ການວັດລະດັບຄວາມເພິ່ງພໍໃຈ ກ່ຽວກັບ ໂຄງການທົດລອງການປິ່ນປົວດ້ວຍເຄື່ອງກັ່ນອົກຊີ ໃນໂຮງໝໍເມືອງ ເຊໂປ ແລະ ພະລານໄຊ, ທີ່ ແຂວງ ສະຫວັນນະເຂດ, ປະເທດລາວ. ການສຶກສາດັ່ງກ່າວ ຈະເປັນຜົນປະໂຫຍດໂດຍທາງອ້ອມໃຫ້ແກ່ ກຸ່ມຕົວ ຢ່າງທີ່ເຂົ້າຮ່ວມໃນການສຶກສາຄັ້ງນີ້ ແລະ ເປັນຂໍ້ມູນພື້ນຖານ ໃນການສຶກສາຄົ້ນຄວ້າຄັ້ງຕໍ່ໆໄປ ຂອງນັກ ສຶກສາ ແລະ ນັກຄົ້ນຄວ້າໃນວົງການແພດລາວ ໃນອະນາຄົດ.

ດັ່ງນັ້ນ ຈຶ່ງໄດ້ຮຽນສະເໜີມາຍັງທ່ານ ເພື່ອຄົ້ນຄວ້າພິຈາລະນາ ຕາມທາງຄວນດ້ວຍ

ຮຽນມາດ້ວຍຄວາມເຄົາລົບ ແລະ ນັບຖືຢ່າງສູງ

ລາຍເຊັນຜູ້ສະເໜີ

ດຣ. ສອນສະຫວັນ ພິມມະສິນ

APPENDIX F

Time schedule

No	Administration Timeline	Time frame (Month)											
		2013							2014				
		6	7	8	9	10	11	12	1	2	3	4	5
1	Literature review	■	■	■	■	■	■						
2	Proposal development			■	■	■	■						
3	Questionnaire development include validity and reliability				■	■	■						
4	Ethical consideration							■					
5	Field preparation and data collection								■	■	■		
6	Data analysis											■	
7	Conclude and Write up of full report												■

APPENDIX G

Budget

No	Activities	Cost	Unites	Total
1	Pretest	12	20	240
	Data collection			
2	International Travel	5,000	4	20000
3	Local travel	5,000	2	
4	Accommodation	800	10	8000
5	Interview	50	385	10000
6	questionnaire	50	385	19250
7	stationary	700	1	700
8	photocopy of Exam and final	500	10	5000

Total	63,190.00	Baht

VITA

PERSONAL INFORMATION

Name and surname: Mr. Sonesavanh Phimmasineal

Age: 27 years old

Date of birth: 15 February 1987

Marital status: single

Nationality: Laotian

Address: DongDok village, Xaythany district,Vientiane Capital, Lao PDR

Place of Birth: Sykhay village, Xaybouly district, Savannakhet provice

Mobile number: (856-20) 78872283

E-mail: Sonesavanh_pex@yahoo.com

BACKGROUND and EXPERIENCES

EDUCATION

2013-2014: Candidate of Master of public Health, College of Public Health Science, Chulalongkorn University

2004-2010: Bachelor degree of Medial Doctor at University of Health Sciences, Laos PDR

2004-2009: Bachelor degree of English Language, major of English Pedagogy, Faculty of Education, National University Of Laos

WORK/VOLUNTEER EXPERIENCES

2011 - 2013: Special Service Agreement (SSA), Technical Assistant at Emerging Diseases Surveillance and Respond (ESR), World Health Organization (WHO)