HEALTH-RELATED QUALITY OF LIFE AND SATISFACTION WITH HEALTH SERVICE OF THALASSEMIA PATIENTS

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Thesis
Entitled

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HEALTH-RELATED QUALITY OF LIFE AND SATISFACTION WITH HEALTH SERVICE OF THALASSEMIA PATIENTS

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ABSTRACT

In Thailand, thalassemia is an important inherited disease. Thalassemia particularly affects the red blood cells. However, the impact of thalassemia on patient's quality of life (QOL) is rarely known. This study was conducted to assess the health-related quality of life (HRQOL) of thalassemia patients in order to explore factors affecting on their QOL, as well as examine the patients' satisfaction with health care services. The PedsQL 4.0 generic core scales (Thai version) were administered to children with thalassemia at three treatment centers (Saraburi Hospital, King Chulalongkorn Memorial Hospital and Phramongkutklao Hospital). Demographic and clinical characteristics were obtained from medical chart reviews. Three hundred and sixty two thalassemia patients, ages 2 to 18, were enrolled in the study.

Results revealed that the mean ± SD total HRQOL score was 76.67 ± 11.40 for children who were self-reporting and it was 74.69 ± 14.42 for parent proxy reports. These patients indicated having some impairment in the physical domain, as shown in the score of 78.24 ± 14.77. In the psychosocial domain, the school functioning score was the lowest (67.89 ± 15.92), followed by the emotional functioning score (75.90 ± 16.62) and the social functioning score (83.71 ± 14.73), respectively. These findings indicated that age, the onset age of anemia, the severity of the disease (severe or non-severe), treatment status (regular or non-regular treatment) and pre-transfusion Hb level were significantly associated with the QOL of thalassemia children. Satisfaction questionnaires revealed that the patients in every treatment center reported a high satisfaction level with health services. In addition, no significant differences in satisfaction levels were found across payment schemes.

These findings suggest that regular treatments should be provided for these patients since it could improve the patient's QOL. By receiving regular treatments, patients would be receiving blood transfusions if their Hb level are < 7 g/dL. They would receive iron chelation therapy when the serum ferritin level rises above 1000 ng/ml, and if they are diagnosed with homozygous-beta thalassemia or if the onset of anemia occurred before 2 years of age and their blood transfusion occurred before 4 years of age they would receive a high transfusion. In addition, special attention should be given to severe cases since they reported the lowest QOL.

KEY WORDS: THALASSEMIA / QUALITY OF LIFE / PEDSQL / SATISFACTION / CHILDREN

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การศึกษาคุณภาพชีวิตด้านสุขภาพและความพึงพอใจต่อการรับบริการทางการแพทย์ของผู้ป่วยธาลัสซีเมีย (HEALTH-RELATED QUALITY OF LIFE AND SATISFACTION WITH HEALTH SERVICE OF THALASSEMIA PATIENTS)

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บทคัดย่อ

โรคธาลัสซีเมีย คือ โรคโลหิตจาง ทางพันธุกรรมที่เป็นปัญหาทางสาธารณสุขที่สำคัญของประเทศไทย อย่างไรก็ตาม การศึกษาคุณภาพชีวิตของผู้ป่วยธาลัสซีเมียยังไม่มีการศึกษามากนัก การศึกษานี้มีวัตถุประสงค์เพื่อประเมินคุณภาพชีวิตด้านสุขภาพของผู้ป่วยธาลัสซีเมีย ศึกษาปัจจัยที่มีผลต่อคุณภาพชีวิตของผู้ป่วยธาลัสซีเมีย และประเมินความพึงพอใจของผู้ป่วย แบบสอบถาม คุณภาพชีวิต PedsQL ได้ถูกนำมาใช้ในการประเมิน คุณภาพชีวิตของผู้ป่วยธาลัสซีเมียอายุ 2-18 ปี จำนวน 362 คน จาก 3 โรงพยาบาล ได้แก่ โรงพยาบาลศูนย์สระบุรี โรงพยาบาลจุฬาลงกรณ์ และโรงพยาบาลพระมงกุฎเกล้า ข้อมูลลักษณะโดยทั่วไปของผู้ป่วยและข้อมูล ผลการรักษาทางคลินิกได้จากการทบทวนเวชระเบียน

ผลการศึกษาพบว่า ค่าเฉลี่ย (ค่าเบี่ยงเบนมาตรฐาน) ของคะแนนรวมคุณภาพชีวิตของผู้ป่วยธาลัสซีเมียที่รายงานด้วยตัวเด็กและผู้ปกครอง คือ 76.67 (11.40) และ 74.69 (14.42) คะแนน ตามลำดับ ค่าเฉลี่ยคะแนนคุณภาพชีวิตด้านกายภาพ คือ 78.24 (14.77) คะแนน สำหรับด้านจิตใจและสังคม พบว่า เด็กธาลัสซีเมียมีคะแนนคุณภาพชีวิตด้านโรงเรียนต่ำที่สุด คือ 67.89 (15.92) คะแนน รองมาเป็นด้านอารมณ์ โดยมีคะแนน 75.90 (16.62) คะแนน และด้านสังคมโดยมีคะแนน 83.71 (14.73) คะแนน ผลที่ได้จากการศึกษาบ่งชี้ว่า อายุ อายุที่เริ่มซีด ความรุนแรงของโรค (รุนแรง หรือ ไม่รุนแรง) ชนิดของการรักษา (การรักษาแบบ regular หรือ non-regular) และระดับฮีโมโกลบิน เป็นปัจจัยที่มีผลต่อคุณภาพชีวิตของผู้ป่วยธาลัสซีเมียอย่างมีนัยสำคัญทางสถิติ จากการสอบถามความพึงพอใจในการรับบริการทางการแพทย์ พบว่า ผู้ป่วยจากทั้ง 3 โรงพยาบาล มีความพึงพอใจสูงต่อการบริการที่ได้รับและเมื่อจำแนกโดยสิทธิทางการรักษาพบว่า ความพึงพอใจ ของผู้รับบริการในแต่ละสิทธิทางการรักษาไม่แตกต่างกัน

จากการวิจัยครั้งนี้มีข้อเสนอแนะว่า การให้การรักษาอย่างเหมาะสม (regular treatment) ซึ่งประกอบด้วยการให้เลือดในผู้ป่วยที่ระดับฮีโมโกลบินต่ำกว่า 7 g/dL การให้ยาขับเหล็กเมื่อผู้ป่วยมีภาวะเหล็กเกินหรือมีระดับซีรัมเฟอร์ริตินมากกว่า 1000 ng/ml และการให้เลือดแบบ high transfusion ในกลุ่มผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็นธาลัสซีเมียชนิด homozygous beta-thalassemia และในผู้ป่วยที่เริ่มซีดก่อนอายุ 2 ปีซึ่งได้รับเลือดครั้งแรกก่อนอายุ 4 ปี สามารถเพิ่ม คุณภาพชีวิตของผู้ป่วยธาลัสซีเมีย ได้อย่างมีนัยสำคัญทางสถิติ นอกจากนี้ผู้ป่วยที่มีอาการรุนแรงควรได้รับการดูแลเป็นพิเศษเพื่อเพิ่มระดับคุณภาพชีวิต

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LIST OF ABBREVIATIONS

%	Percent
CSMBS	Civil Servant Medical Benefit Scheme
Hb	Hemoglobin
Hct	Hematocrit
HRQOL	Health-related quality of life
OOP	Out of pocket
PedsQL	Pediatric quality of life
QOL	Quality of life
UC	Universal coverage

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CHAPTER I
INTRODUCTION

Background and Rationale

Thalassemia is a genetic blood disorder which can be fatal if proper treatment is not received. It directly affects physical health leads to physical deformity, growth hormone insufficiency, hypothyroidism, growth retardation, and delayed puberty (1, 2). Abnormalities can be detected in every organ system such as heart, liver, spleen, and endocrine system (3-5). There are almost 300 million carriers of this hemoglobin disorder in the world, with the majority living in South East Asia (6-8). In Thailand, Sukpanichanan S. (9) estimated that about 1% of the Thai population is affected with thalassemia disorder. The distribution and high frequency of thalassemia reflects the fact that these genetic abnormalities provide a selective advantage in a region that is endemic for P. falciparum malaria. This is because red blood cells, particularly those with thalassemia, are poor environments for the malaria parasite and so carries for these haemoglobinopathies are less likely to develop severe malaria and die from it (10).

Children with thalassemia have serious implications for the health-related quality of life. The children have to undergo blood transfusions at least once a month depending on severity of disease. Because of this reason, they have to attend the hospital which sometimes takes a whole day. They also have to get desferrioxamine injections for iron chelation therapy to remove excess iron in their blood from the blood transfusions. Besides, the impact of thalassemia on physical appearance, such as bone deformities and short stature, leads to poor self-image (11, 12).

Health-related quality of life (HRQOL) comprises of the physical, psychological and social domains of health that are influenced by a person's experiences, beliefs, expectations, and perceptions (13). HRQOL measurement is a multidimensional concept that represents the patient's overall perception of the impact of illness and its treatment (14). For those individuals diagnosed with a chronic

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condition where cure is not attainable and therapy may be prolonged, quality of life is likely to be the essential outcome. HRQOL can be used to describe aspects of the impact of disease or illness in individuals and evaluate the impact of individual treatments or programs of services to population. In addition, HRQOL assessment can predict the future status of people with an illness or condition (15).

Quality of life measures are increasingly used as assessments of the outcome of medical care for many patient populations. Although many HRQOL measures have been developed for use in adult populations, less attention has been given to pediatric quality of life measures. Pediatric quality of life measurement is distinct from that for adults due to development, dependence, different epidemiology, demographic factors, and differences between the child and adult health services systems (16). Furthermore, because the impact of disease and treatment may be substantially different for adults and children, HRQOL outcomes from clinical trials with adults cannot be applied to children. It is therefore necessary to directly examine HRQOL among children, rather than estimating pediatric HRQOL outcomes based on research with adults.

A recent study in adults with thalassemia suggested that treatment and cultural differences did not have a major effect on the QOL of patients (11, 17, 18). Pakbaz et al. (19) previously suggested that emotional functioning is one of the impaired quality of life domains in patients affected by thalassemia and a further study showed that thalassemia patients scored low in their emotional functioning (12).

Based on the literature reviews, it was found that severity of disease (10), accessibility and compliance with treatment such as blood transfusion and iron chelation therapy (1, 10, 12, 19) , serum ferritin level (the indicator for iron overload) (20) and complications (2, 3, 5, 19) , were related to quality of life of thalassemia patients. Furthermore, the effect of thalassemia on patient's HRQOL was to reduce their physical, social, school and emotional functioning (12). In Thailand, the health-related quality of life of children with thalassemia has not been evaluated. In addition, the research examining the satisfaction of thalassemia patient utilizing healthcare services has not been identified. Factors associated with health-related quality of life and satisfaction of thalassemia patients were rarely identified.

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Research Question

1. How are the quality of life of Thai children with thalassemia?
2. What are the factors affecting quality of life in thalassemia patients?
3. How are the satisfactions of thalassemia patients on healthcare service?

Objective

1. To examine the health-related quality of life of thalassemia children and adolescents
2. To explore factors influencing quality of life of children and adolescents with thalassemia
3. To evaluate the satisfaction of thalassemia patients or their parents on healthcare service

Expected outcome and Benefits

The results will be of beneficial to provide better understanding health status of children and adolescents with thalassemia. Also, by knowing quality of life, factors associated with quality of life and satisfaction about health service among these patients can help assisting in clinical decision-making, improve patient and parent satisfaction, facilitate patient-physician communication, and identify hidden morbidities. Furthermore, utilization of HRQOL measures at the population health level may assist in the evaluation of the healthcare needs of a community. The result of this study can also be used to influence public policy decisions, including the development of strategic healthcare plans, identifying health disparities, and aiding in the allocation of healthcare resources in order to improve quality of life among thalassemia patients.

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Definition of terms

Type of transfusions

In this study, type of transfusion can be classified by the frequency of blood transfusion, as shown in Table 1

Table 1 Type of transfusion classified by the frequency of blood of transfusion

Type of transfusion	Frequency of transfusion
High transfusion	>13 times/year
Low transfusion	6-12 times/year
Occasional transfusion	1-5 times/year

Severe thalassemia patients

In this study, patients were classified as severe if they met at least one of the following criteria 1) patients whose onset of anemia were before 2 years of age and first transfusion occurred before 4 years of age, 2) patients who were diagnosed as homozygous beta-thalassemia, 3) patients whose pre-transfusion Hb level was less than 7 g/dL.

Non-regular treatment

1. Patients were classified as receiving non-regular treatment if they met at least one of the following criteria:

2. Patients whose pre-transfusion Hb level was lower than 7 g/dL, who received no blood transfusion

3. Patients whose serum ferritin level was higher than 1000 ng/ml, who did not receive iron chelation therapy

4. Patients whose onset of anemia was before 2 years and first transfusion occurred before 4 years of age, who did not receive high transfusion

5. Patients who had diagnosed as having homozygous beta-thalassemia, who did not receive high transfusion

Regular Treatment

Patients were classified as having regular treatment if they did not meet the criteria of having non-regular treatment.

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CHAPTER II
LITERATURE REVIEW

Thalassemia syndromes

Thalassemia is an inherited disease of the red blood cells, classified as a hemoglobinopathy. The genetic defect results in synthesis of an abnormal hemoglobin molecule. The blood cells are vulnerable to mechanical injury and die easily. To survive, many people with thalassemia need blood transfusions at regular intervals.

Type of diseases

The thalassemias are classified according to which chain of the globin molecule is affected: in α-thalassemia, the production of α-globin is deficient, while in β-thalassemia the production of β-globin is defective. Thalassemia produces a deficiency of α- or β-globin, unlike sickle-cell disease which produces a specific mutant form of β-globin. Treatment needs a decision on phenotypic diagnosis by severity of thalassemia disease. Thalassemia can be classified by severity of disease into 4 types as the followings:

Bart's hydrops fetalis or homozygous alpha-thalassemia 1

Homozygous α-thalassemia, caused by a deletion of all four α-globin genes, leads to the formation of high levels of Hb Barts in utero. Hb Barts has an extremely high oxygen affinity and therefore delivers little oxygen to fetal tissues. The severe hypoxia results in cardiac failure, massive ascites and intrauterine death (21).

Homozygous beta-thalassemia

Homozygous beta thalassemia major, also known as Cooley's anemia, is an inherited blood disorder that affects a person's ability to produce beta protein, causing anemia. Cooley's anemia is the most severe form of beta thalassemia disease in which the complete lack of beta protein in the hemoglobin causes a life-threatening anemia that requires regular blood

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transfusions and extensive ongoing medical care. These extensive, lifelong blood transfusions lead to iron-overload that must be treated with chelation therapy to prevent early death from organ failure. Generally, chelation therapy is any drug treatment that helps the body rid itself of excessive levels of iron, a condition known as iron overload (22).

Beta-thalassemia/Hb E disease

Beta-thalassemia/hemoglobin E (beta-thal/Hb E) is the commonest form of hemoglobinopathy in Thailand (23). If a person inherits one Hb E gene and one beta thalassemia gene, the combination produces Hb E-beta thalassemia which causes a moderately severe anemia similar to beta thalassemia intermedia. As some of the patients with thalassemia grow older, they become transfusion-dependent. Others remain asymptomatic throughout late adulthood.

Hemoglobin H disease

The patients with Hb H disease usually have no symptoms and in a steady state do not need treatment. However, after infection many patients develop severe hemolytic anemia, jaundice, requiring blood transfusion and other appropriate treatments.

Blood transfusion therapy

Transfusion therapy should only begin once a diagnosis of thalassemia major is confirmed which based on (24):

- Laboratory test (e.g. complete blood count and hemoglobin electrophoresis or hemoglobin analysis such as high pressure liquid chromatography (HPLC).
- Genetic analyses to identify the nature of β- and α-thalassemia mutations that can help predict the severity of the disease and identify the treatment regimen most appropriate to each patient.

The severity of anemia is usually assessed on the basis of levels of hemoglobin (Hb) in the blood. A normal Hb level is generally considered to be between 13-16 g/dl in men and 11-14 g/dl in women and children. In both men and women, Hb levels of

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between 8-11 g/dl represent moderate anemia, with severe anemia at levels less than 8 g/dl.

Patients should only begin transfusion therapy once thalassemia has been confirmed through laboratory diagnosis and molecular studies, and when:

- Hb levels are registered at less than 7 g/dl on two successive occasions, more than two weeks apart. Sometime, patients may grow normally with Hb levels between 6-7 g/dl but a decision not to transfuse under these circumstances requires great clinical experience and careful observation.
- Hb levels are more than 7 g/dl but accompanying physical characteristics are noted, such as:
    - Facial changes
    - Poor growth and limited weight gain
    - Bone fractures
    - Extra-medullar hematopoiesis, resulting in tumor masses

Where these criteria are observed, transfusion therapy should not be delayed.

Iron overload

The main source of iron overload in patients receiving transfusions is blood transfused. It is important that patients on regular blood transfusions use iron chelators in order to bind with iron and remove it.

The clinical symptoms of iron overload generally appear around the age of 10, although evidence of the toxic effects of iron has been found in the liver of much younger children. Injury to the liver, known as fibrosis, begins within two years of the start of transfusions. Serious liver injury (cirrhosis) can develop before the age of 10 if there has not been treatment to remove the excess iron, particularly where the patient has hepatitis B and/or C. Heart disease, one of the most frequent causes of death in thalassemia major, has also been reported within 10 years of the start of a transfusion regimen, although heart failure does not usually occur until after 15 years or more.

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Iron loading is also the most important cause of delayed sexual maturation in patients with thalassemia, affecting about half of both male and female patients. In addition, iron loading is frequently a cause in the development of diabetes mellitus.

Over the long term, excess iron causes bone complications and damage to other important organs such as the thyroid and parathyroid. Therefore patients must receive treatment to remove excess iron, which will otherwise accumulate in the body with serious effects on the patient's quality of life and length of survival (24)

Iron chelation treatment

Patients with thalassemia major should only begin Desferrioxamine (DFO) or once they have begun regular blood transfusion therapy. DFO does not solve any of the problems caused by insufficient blood transfusion therapy, such as anemia, bone changes or enlargement of the liver and spleen. DFO should not be given to untransfused or under-transfused patients unless they are over 10 years old or there is evidence of iron-loading. As a general rule, patients should begin iron chelation treatment once they have had 10-20 transfusions, or when ferritin levels rise above 1000 µg/l (24).

Because of the large size of DFO molecules, the body absorbs little DFO via the gut. The best way of delivering DFO is subcutaneously or intravenously through a vein. At the same time, because DFO is rapidly eliminated from the blood the drug must be delivered slowly over a period of time, in order to obtain a steady concentration in the blood for as long as possible. DFO is administered via a specially designed pump that slowly infuses the drug under the skin over 8-12 hours at least 6 days a week. The exact dose for each patient is calculated on the basis of age, body iron load and clinical condition. In general, average doses for children should not exceed 20-40 mg/kg of body weight, as high doses may slow growth. The standard dose for adults is 30-50 mg/kg of body weight (24).

However, treatment with desferrioxamine is cumbersome, expensive, unpleasant and presents some long term toxic effects. First, many patients find difficulty in complying with daily subcutaneous desferrioxamine administration which is burdensome, painful, and time consuming. Second, infusions are not given continuously, allowing toxic non-transferrin bound iron (NTBI) to accumulate in

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plasma between infusions. Third, over 90% of the world's patients with thalassemia can not afford desferrioxamine. Fourth, adverse effects are associated with desferrioxamine including allergy, pain at the site of infusion, ocular and auditory abnormalities, neurotoxicity, changes in renal function, and failure of linear growth in young children (25).

The oral iron chelating agent

Deferiprone (1,2 dimethyl-3-hydroxypyrid-4-one, L1)

Deferiprone or L1 (DFP) is an oral iron chelator effective in removing iron. It was licensed first in India in 1995 and subsequently in Europe in 1999. At present, DFP is licensed in Europe for patients for whom treatment with DFO is inadequate. Overall DFP is currently available in approximately 50 countries. Agranulocytosis is the most serious side effect. More common but less serious side effects are gastrointestinal symptoms (e.g., nausea, vomiting, gastric discomfort), arthralgia, zinc deficiency, and fluctuating ALT levels, particularly in anti-hepatitis C virus (HCV)–positive patients (4). A recent study found that long-term therapy with deferiprone might not provide adequate control of body iron in a substantial proportion of patients with thalassemia major (26).

Deferasirox

Deferasirox is an orally active chelator that is highly selective for iron. Specifically, the deferasirox molecule is a tridentate ligand that binds iron with high affinity, forming a 2:1 complex that is excreted in bile and eliminated primarily via the faeces. The most common adverse events included rash, gastrointestinal disturbances, and mild nonprogressive increases in serum creatinine. No agranulocytosis, arthropathy, or growth failure was associated with deferasirox administration. Deferasirox is a promising once-daily oral therapy for the treatment of transfusional iron overload (27).

Clinical practice guidelines for management of thalassemia syndromes

The management of thalassemia syndromes is based on phenotypic diagnosis and severity of thalassemia disease (28), as the followings;

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1. Severe beta-thalassemia, which can be classified as having baseline hemoglobin concentrations < 7g/dL (Hct < 20%). The phenotypic diagnosis can be either homozygous beta-thalassemia or beta-thalassemia/Hb E disease. Choices of treatment among this group are as follows:

a. Stem cell transplantation

b. High transfusion and iron chelation

c. Low transfusion and iron chelation and undergone spleenectomy if necessary

2. Moderate to severe thalassemia, which can be classified as having base line hemoglobin concentration between 7 to 9 g/dL (Hct 20-27%). The phenotypic diagnosis can be either major beta-thalassemia/Hb E disease, some cases of Homozygous beta-thalassemia or Hb H disease. Choices of treatment are as follows:

a. High transfusion and iron chelation

b. Low transfusion or when occurs acute hemolysis and undergone splenectomy if necessary

3. Mild thalassemia which can be classified as having base line hemoglobin concentrations ≥ 9g/dL (Hct ≥ 27%). The phenotypic diagnosis can be either Hb H disease, Hb A-E Bart's disease, Homozygous Hb CS, or beta-thalassemia/Hb E. For treatment, blood transfusion is required only when acute hemolysis occurs.

4. Asymtomatic such as Homozygous α-thal 2 or Homozygous Hb E: No need for treatment, however, genetic counseling and routine checkup should be given.

Epidemiology of thalassemia in Thailand

Thalassemia occurs in all populations and ethnic groups, however the prevalence differs among different populations. Ethnic groups originating from regions with malaria have a high frequency of thalassemia mutations. There are almost 300 million carriers of this hemoglobin disorder in the world, with the majority living in South East Asia (4). The frequency of α- thalassemia reaches 25% in Thailand, and Hb E approaches 60% in many regions of Thailand, Laos and Cambodia. Hb Constant Spring is found in 1%-10% of the population in these areas. The World Health Organization (WHO) estimates that Thailand will have over

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250,000 symptomatic thalassemia patients diagnosed over the next few decades (6, 8, 21, 29).

In Thailand, with a population of 65 million, approximately 40% are thalassemia traits or carriers and 1% of the Thai population are affected with thalassemia diseases (9). Since thalassemia is common genetic disorder in Thailand thus it is not only an important public health problem but also socio-economic problems of the country.

The treatment of major thalassemia diseases consists of blood transfusions. Adequate blood transfusions have been shown to prevent defective physical development and abnormal bones, and lead to general well-being. The constant complication of increased iron deposition in the body, which leads to organ damages and death, can be reduced by giving iron chelation agents such as desferrioxamine. Both measures together can prolong life, apparently to near normal. However, in a developing country like Thailand, the accessiblity to these treatments may be a problem due to its cost. Only the rich can afford the treatment and the government can support treatment for only the minority of the cases. This inequity of care brings discomfort to concerned individuals also leads to and is associated with economic and ethical issues.

Health-related quality of life

Definition of health-related quality of life

The World Health Organization (WHO) defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease” (30). The term quality of life (QOL) was defined as all aspects of patients’ well-being including, for example, spiritual and economic health (31).

The last decade has evidenced a dramatic increase in the development and utilization of health-related quality of life (HRQOL) measures in an effort to improve patient health and determine the value of healthcare services. Definitions of HRQOL vary widely, but there are two central aspects of this construct (32-34). First, HRQOL is subjective, and therefore, it should be assessed from the patient’s perspective whenever possible. Second, HRQOL is a multidimensional construct that integrates a broad range of outcomes (13). One definition that includes both of these components

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describes HRQOL as an individual's subjective perception of the impact of health status, including disease and treatment, on physical, psychological, and social functioning (35). Another definition of HRQOL, Matza et al. (13) describes HRQOL as the physical, psychological and social domains of health that are influenced by a person's experiences, beliefs, expectations, and perceptions.

Currently, health-related quality of life (HRQOL) is humanistic outcome which was increasingly used as outcome measure in clinical trial research.

Methodological issue in pediatric HRQOL assessment

More research on QOL among children is necessary to identify broader outcomes and provide a through understanding of children's health status. However, many Health-related quality of life (HRQOL) measures have been developed for use in adult population. Presently, small but growing body of research has examined pediatric QOL and researchers are becoming more aware of the unique challenges involved in assessing QOL among children. To measure HRQOL among pediatric patients, it is important o ensure that items correspond to experiences, activities, and contexts that are directly relevant to the children.

This section reviews three methodological issues that must be considered when designing a measure or a study of pediatric HRQOL.

The youngest age at which children can report their HRQOL

In a review of pediatric health outcomes literature, Landgraf and Abetz (36) indicated that there are age-related differences in the type of health concepts that children can comprehend. They reported that children as young as age 5 can provide empirically reliable reports on concrete health concepts such as pain and medication use. In contrast, questionnaires that assess relatively subjective or abstract domains of HRQOL, such as the emotional impact of illness, will likely be appropriate for older children.

There are several ways to address this issue when assessing health status and HRQOL in pediatric clinical trials. First, when developing a questionnaire, it is necessary to conduct pilot testing and careful cognitive debriefing with children of different ages in order to determine the lower age limit at which children can understand the questions and provide reliable and

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valid responses. Second, when determining the lower age limit of a clinical trial sample, it will be necessary to consider the disease area, the anticipated effects of the drug being tested, and the type of domains to be assessed. Third, because greater variability is expected with younger children due to measurement error, a large sample size will be required to detect treatment effects (13).

The proxy question

There are many controversies in the pediatric health outcomes literature concerning who is the most appropriate respondent when assessing children's HRQOL (37). There is a concern that children may not provide accurate or reliable reports of their own health status when they respond to a questionnaire due to factors such as limited understanding of the questions asked, limited understanding of their disease or health, potential biases or time perception differences (38). Selection of the primary respondent should be carefully considered. Biological relationship to the target child may not always be the best determinant. In some cultures, extended family member (i.e., grandfather, grandmother, aunts or uncles) assume primary responsibility for providing care to a child and may be the most knowledgeable respondent (36).

The disadvantage of child-report instruments is that children, particularly at younger ages, may not be able to provide reliable information on their HRQOL. Thus, before implementing a child-report HRQOL measure, researchers will need to evaluate the age appropriateness of the instruments, including the vocabulary, instructions, content, and response options.

There are disadvantages of using parents as proxy respondents. First, a proxy report is inconsistent with the concept of HRQOL, which is defined according to the patient subjective view. Second, the proxy method raises questions concerning which parent to use and whether mother and father reports can be considered equivalent (32, 36). Third, it is likely that parents' reports of a disease's impact on their children will be biased by how the parents themselves are affected. Finally, it is not always clear whether parents are the most appropriate adult proxy respondent (36). Some children may

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spend more time with a teacher, day-care provider , or other family member than with a parent, and this other adult may have more accuracy insight into the child's social and psychological functioning (13).

Whenever a child is able to provide reliable and valid data, the child's self report is the ideal strategy because it is consistent with the definition of HRQOL, which emphasizes the patient's subjective perspective.

Age-appropriate instrument formatting and design

The specific, design and format of each pediatric HRQOL instrument will depend on numerous factors including the content of the items and the ages of the intended respondents. Thus it is recommended that instruments be pilot tested so that formatting and administration procedures can be evaluated before using the measure with a large sample. Cognitive debriefings, in which children are asked to comment on instruments, can also provide important information regarding the age appropriateness of items before using an instrument in pivotal studies (13).

Generic and Disease specific HRQOL measures

Generic measures can be used to compare the HRQOL impact of various diseases. There are many generic instruments such as SF-36, WHOQOL, EuroQOL and PedsQL. In addition, data from patients with a specific disease can be compared to general pediatric population norms to determine the impact of the disease on HRQOL.

Disease-specific or condition-specific measures take into account aspects of disease and treatment that are relevant to specific medical conditions. There are many disease-specific instruments such as The Childhood Asthma Questionnaire (CAQ) (39), Diabetes Quality of Life Instrument (DQOL) (40), Quality of Life in Children with Crohn's Disease (41), and Pediatric Cancer Quality of Life Inventory (PCQL) (42). Compared to generic measures, these measures tend to be more sensitive to changes, and they may be more effective at detecting treatment effects. Therefore, they are often used in clinical trials. Disease-specific pediatric measures are available for a number of medical conditions, such as asthma, allergic rhinitis, cancer, diabetes,

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epilepsy, juvenile arthritis, and spina bifida (39, 42-46). Nevertheless, disease-specific instrument for thalassemia disease is not available.

Selection of HRQOL instruments for use in pediatric clinical practice

For HRQOL instruments to be utilized in pediatric clinical practice, they must follow these criteria: 1) they must be brief, but maintain reliability and validity and provide novel, value information; 2) they should be well-designed both for ease of use by patients/parents and for quick, easy scoring and interpretation; and 3) they must be responsive to meaningful patient change (47).

The PedsQL Measurement Model for the Pediatric Quality of Life

The PedsQL measurement model is a modular approach to measuring health-related quality of life (HRQOL) in healthy children and adolescents and those with acute and chronic health conditions. The PedsQL measurement model integrates both generic core scales and disease-specific modules into one measurement system.

Pediatric HRQOL measurement instruments must be sensitive to cognitive development and must include both child self-report and parent proxy-report. Accordingly, the PedsQL measurement model consists of developmentally appropriate forms for children ages 2-4, 5-7, 8-12, and 13-18 years. Pediatric self-report is measured in children and adolescents ages 5-18 years, and parent proxy-report of child HRQOL is measured for children and adolescents ages 2-18 years.

Pediatric HRQOL instruments must have a clear conceptualization of the HRQOL construct for pediatric populations. A pediatric HRQOL instrument must be multidimensional, consisting at a minimum of the physical, mental, and social health generic core dimensions delineated by the World Health Organization (WHO) in 1948 (30). The 23-item PedsQL generic core scales were designed to measure these core dimensions of health as delineated by the WHO, as well as role (school) functioning. Thus, the multidimensional PedsQL generic core scales encompass the essential core domains for pediatric HRQOL measurement as follow:

1. Physical functioning (8 items)
2. Emotional functioning (5 items)
3. Social functioning (5 items)

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4. School functioning (5 items)

Internal consistency reliability of the PedsQL was excellent, with Cronbach alpha for the generic core scales in both self- and proxy-report greater than the 0.70 standard, and Cronbach alpha for the full 23-item scale approaching 0.90 for self- and proxy-report. Missing data were minimal. Item response distributions were across the full scale range, with no floor effects, and minimal ceiling effects (48).

Scoring instructions

The PedsQL™ Generic Core Scales are easy to score. The items of the four scales (physical functioning, emotional functioning, social functioning, and school functioning) are grouped together on the actual questionnaire, so it is easy to create Scale Scores.

1. On the PedsQLTM Generic Core Scales, for ease of interpretability, items are reversed scored and linearly transformed to a 0-100 scale, so that higher scores indicate better HRQOL (Health-Related Quality of Life).

2. To reverse score, transform the 0-4 scale items to 0-100 as follows: 0=100, 1=75, 2=50, 3=25, and 4=0.

3. To create Scale Scores, the mean is computed as the sum of the items over the number of items answered (this accounts for missing data). If more than 50% of the items in the scale are missing, the Scale Score should not be computed. Imputing the mean of the completed items in a scale when 50% or more are completed is generally the most unbiased and precise method. To do this, count the number of missing values in the scale (call it nmiss). Next, sum the item scores and divide by the number of items in the scale minus nmiss. Alternatively, use the Compute command in SPSS to compute the MEAN.

4. To create the Psychosocial Health Summary Score, the mean is computed as the sum of the items over the number of items answered in the Emotional, Social, and School Functioning Scales. The Physical Health Summary Score is the same as the Physical Functioning Scale Score.

5. To create the Total Scale Score, the mean is computed as the sum of all the items over the number of items answered on all the Scales.

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Advantages of the PedsQL

Advantages of the PedsQL include brevity (23 items), availability of age appropriate versions and parallel forms for child and parent, cover wider spectrum of health than other instruments, easy to administer via telephone (49), develop for infants and toddlers as well as self-reported (child) forms for children aged 5 and older, and flexible instrument as result as disease-specific modules can be integrated with the generic scales (50).

PedsQL translations

The PedsQL scales were translated into multiple international languages, 65 languages (51). Both child self-reports and parent proxy-reports (age range 2-18 years) have been translated in Thai language version. The version for age range 8-12 years old has been used for assessment of quality of life in Thai children with attention-deficit/hyperactivity disorder (ADHD) by Pongwilairat K et al. (52).

PedsQL™ Administration Guidelines

The following guidelines are intended for use by individuals trained in the administration of standardized questionnaires. The PedsQL™ administrator is crucial in developing rapport with the respondents, emphasizing the importance of the questionnaire, addressing concerns, and ensuring that the PedsQL™ is completed accurately and confidentially

General Protocol

1. Create a procedure for assigning identification numbers that will allow for parent/child comparisons as well as comparisons of baseline/follow-up data.

2. If feasible, the PedsQL™ should be completed before the respondents complete any other health data forms and before they see their physician or healthcare provider.

3. The parent/child should first complete the PedsQL™ Generic Core Scales and then complete any additional PedsQL™ Module.

4. Parents, Children (8-12) and Teens (13-18) may self-administer the PedsQL™ after introductory instructions from the administrator. If the administrator determines that the child or teen is unable to self-administer the PedsQL^{TM} (e.g., due

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to illness, fatigue, reading difficulties), the PedsQL™ should be read aloud to the child or teen. For the Young Child (5-7), the PedsQL™ should be administered by reading the instructions and each item to the young child word for word. At the beginning of each subscale repeat the recall interval instructions (one month or 7 days) to remind the young child to respond only for that specific recall interval. Use the separate page with the three faces response choices to help the young child understand how to answer. When reading items aloud to a child, intonation should be kept neutral to avoid suggesting an answer.

5. If a child has difficulty understanding the age-appropriate PedsQL™, the preceding age group version may be administered to the child (e.g., administering the Young Child (5-7) Self-Report version with the three faces response choices to an 8 year old). However, if a child presents with severe cognitive impairments (as determined by the administrator), the PedsQL™ may not be appropriate for that child. In such cases, only the Parent-Proxy Report should be administered to the child's parent.

6. The parent and child must complete the questionnaires independently of one another. Discourage the parent, child, or other family members from consulting with one another during the completion of the questionnaire. Let them know that they can feel free to discuss their answers following completion of the questionnaires, but that it is important to get both the parent's and the child's individual perspectives. If you are administering the questionnaire to the child, the child should be facing away from the parent.

7. If the child or parent has a question about what an item means or how they should answer it, do not interpret the question for them. Repeat the item to them verbatim. Ask them to answer the item according to what they think the question means. If they have trouble deciding on an answer, ask them to choose the response that comes closest to how they feel. The child and/or the parent has the option of not answering a question if they truly do not understand the question.

8. If a parent/child asks you to interpret the responses, tell her/him that you are not trained to interpret or provide a score for the answers given. If the PedsQL™ is being used for a clinical study, let the parent/child know that their answers will be

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combined with other participants' answers and analyzed as a group rather than as individual respondents.

9. Document all reasons for refusals and non-completions of the PedsQL™

Patient Satisfaction

Parasuraman et al. (1990) (53) indicated that quality of service can be assessed by comparing the expectation and actual service received in 5 aspects.

1. Tangibles, which means physical characteristics of service facilities such as appliances, personnel.
2. Reliability, which means the accuracy and consistency of the services.
3. Responsiveness, which includes the readiness and willingness to provide service, and the promoted response to the patient need.
4. Assurance, which means the ability of the providers in providing the assurance to the patient.
5. Empathy, which means the ability of the providers to provide empathy and to show willingness to help solving the problems of the patient.

Service quality depends on the gap between expectation and perception in quality of actual health service received. If the given service is better than or as same as expected, the service is considered a service of good quality. In contrast, if the given service is less than expected, the service is considered low quality.

Aday and Andersen (1975) (54) studied satisfaction of people toward health care delivery in the United States and found that convenient and price of services were the two most important factors that the patients were satisfied with the most.

Millett (1954) (55)stated that satisfactory service must have the following 5 characters;

1. Equitable service: service provision is rendered equally and fair to all without favoritism utilizing the same standards for all.
2. Timely service: service is provided on time and meets clients' needs.
3. Ample service: service provision that includes adequate and appropriate location, staff and facilities.

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4. Continuous service: service and care provided continuously until healing has been achieved.

5. Progressive service: service provision should continuously seek to improve quality and develop more efficient ways to render services based on the factors above.

In 1974, Aday and Anderson (56) proposed that client satisfaction may affect utilization of physician services, and that utilization, in turn, may affect satisfaction. They described the consumer satisfaction with medical care and explained that consumer satisfaction could be separated into 5 dimensions, as the following:

1. *Satisfaction with convenience:* The convenience and characteristics of place people go for health care provide data on whether there is differential "treatment" of individuals, depending on where they chance to go for services. In addition, waiting time in getting service could be as proxy indicator of convenience in any service.

2. *Satisfaction with courtesy of providers:* Provider was a person who contacted with consumer to serve any service. Characteristics of providers such as personality or conversation would be accepted, responded and valuated by consumer. Consumer was satisfied or dissatisfied when he/she exposed to the characteristics of providers.

3. *Satisfaction with medical information:* Medical information could be classified into information about patient's disease and treatment. Most patients wanted to know what was wrong with them and what treatment that could cure them.

4. *Satisfaction with quality of care:* Consumer expected to receive good service. Quality of service could be defined as accuracy and quick.

5. *Satisfaction with expenditure:* Expenditure of medical care was the cost of physical examination, Lab test, medical appliance and medicine.

Healthcare consumers are demanding excellence in care and services from care providers, and payers are following in their expectations.

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Related studies

A study by Ismail A. et al in 2006 (12) had investigated the health-related quality of life in Malaysian children with thalassemia using the PedsQL 4.0 generic scale score which included physical, emotional, social and role (school) functioning compared to the healthy controls allowing for age, gender, ethnicity and household income. The PedsQL 4.0 was administered to 78 children receiving blood transfusions and treatments at Hospital Kuala lumpur, Malaysia. Accordingly, the questionnaire was also administered to a control group of 235 healthy school children. Patient's ages 5-18 years who informed consent and could read, write, understand Malay, English or Mandarin were included in this study. The exclusion criteria were patients who had bone marrow transplants. The study found that thalassemia had a negative impact on perceived physical, emotional, social and school functioning in thalassemia patients. They also found that the HRQOL of thalassemia patients had significantly lower than the healthy controls. The scores of three of the PedsQL domains (physical, social and school functioning) were statistically significantly lower than those of the healthy controls. The effect of thalassemia on the HRQOL of these children was to reduce their physical, social and school functioning by about 10% to 24%. Moreover, emotional functioning of thalassemia patients was low in comparison to score for emotional functioning of chronically ill children in other studies (42, 57). The results of the multiple regression analysis to explore factor affecting HRQOL in thalassemia patients showed that age was the factor affecting quality of life among thalassemia patients, so the effect of thalassemia appears less for the older children. In summary, this study indicated that continuing support of free desferrioxamine from the Ministry of Health should be given to these patients. More understanding and support especially from health authorities, school authorities and the society is essential to enhance their quality of life.

A study by Pakbaz Z. et al in 2005 (19) had evaluated quality of life in transfusion-independent patients with thalassemia (non-Tx) compared with that in transfused patients (Tx) and identified factors affecting quality of life in thalassemia. The convenient samples of 29 Tx and 19 non-Tx with the mean age of 14.6 years were selected during a comprehensive visit to complete a Dartmouth Primary Care Cooperation Information Chart System (COOP) questionnaires. They found that

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affected domains were feelings such as anxiety, depression, and concern of overall health status or indications of recent deterioration in health. In contrast with previous beliefs, transfusion-independent thalassemia patients also suffered from serious impairment in quality of life. In summary, this study suggested that all patients with thalassemia should undergo quality of life assessment so that interventions focused on affected domains can be implemented.

A study by Telfer P. et al in 2005 (11) had surveyed quality of life in 129 UK patients with thalassemia and 119 Cyprus patients with thalassemia. Two instruments had been assessed, one derived from the WHOQOL-100 questionnaires, and one designed specifically for thalassemia, which assesses psychosocial and clinical burden, as they affect adult patients, parents, and children. The authors suggested that WHOQOL-100 questionnaires were too cumbersome and nonspecific for use in thalassemia so further studies are required to develop and assess such tools for use in thalassemia. They also found that results from patient questionnaires in the United Kingdom and Cyprus were consistent in finding problems with organization of transfusions, insufficient options with chelation therapy, and poor communication. In summary, this study recommended that doctors should spent more time listening to patients in the clinic, and perhaps including a psychologist in the multidisciplinary team to understand patients' individual needs, might enhance adherence with medication.

A study by Mikelli A. and Tsiantis J. in 2004 (58) had determined the presence of depressive symptoms and quality of life in adolescents with beta-thalassemia. They matched 68 thalassemia patients and 68 controls by age and gender. The instruments were the Beck Depression Inventory (BDI) for measuring depressive symptoms and the Short Form-36 (SF-36) for evaluating quality of life. They found that thalassemia patients had more depressive symptoms and lower quality of life than controls. Older thalassemia adolescents experienced fewer depressive symptoms and girls seemed to cope better with the illness than boys. A limitation of this study was the choice of a control group from a hospital sample with orthopedic problems may introduce a bias and not representative of the general adolescent population. In summary, this study provided some evidence that the presence of depressive symptoms may influence the quality of life of thalassemia adolescents.

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A study by Sosothikul D. et al in 1999 (59) had surveyed the psychosocial and financial aspects in children with thalassemia on 200 children at Hematology clinic, Chulalongkorn Hospital in Thailand. The objectives of this study were to study the attitudes about patient's ways of living, to explore the impact of thalassemia on psychosocial and financial aspects and to determine parent's knowledge about thalassemia disease. The questionnaires were designed specific for thalassemia. This study found that thalassemia patients had good adherence and good relationship with doctors. In summary, this study concluded that the attitudes towards taking patients to have treatment at the hospital were significantly related to incomes and education level of their parents. Furthermore, the patient's ways of living were not significantly associated with the periods of their illness and frequency of their follow-up.

Conceptual Framework

Based on the literature reviews and expert opinions, the conceptual framework of this study represented the factors related to thalassemia patient's quality of life. Independent variables were divided into three groups as the following;

First, socio-demographic are general factors that may be affected to patient's quality of life including age, gender and the member of self-help group. The previous studies (11, 12, 58) suggested that age is factor associated with thalassemia patient's quality of life.

Second, clinical characteristics are the main factor that affected to the health-related quality of life of thalassemia patients in many studies (1-3, 5, 10, 12, 19, 20, 60, 61). In this study, we will examine the effect of the following factors on HRQOL of thalassemia patients i.e. diagnosis, Hb level, Hct level, age onset of anemia, age at first transfusion, type of treatment (regular and non-regular treatment), type of blood transfusion, iron chelation therapy, serum ferritin level, spleen intact status and complications.

In this study, severity of disease was classified into 2 levels encompassing severe and non-severe according to age onset, age at first transfusion, diagnosis, and level of Hb. For type of treatment, this study divided the treatment into 2 levels which were regular and non-regular treatment. Type of blood transfusion was grouped by the frequency of blood transfusion as the following: Occasional transfusion (1-5

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times/year), low transfusion (6-12 times/year), and high transfusion (more than 13 times/year).

Finally, other factors that might be associated with health-related quality of life were type of hospital (center and university hospital) and type of payment (CSMBS, universal coverage health scheme and out of pocket).

The conceptual framework of the study was presented in Figure 1. According to the conceptual framework, socio-demographic data, clinical characteristics and other factors were identified as the factors affecting health-related quality of life.

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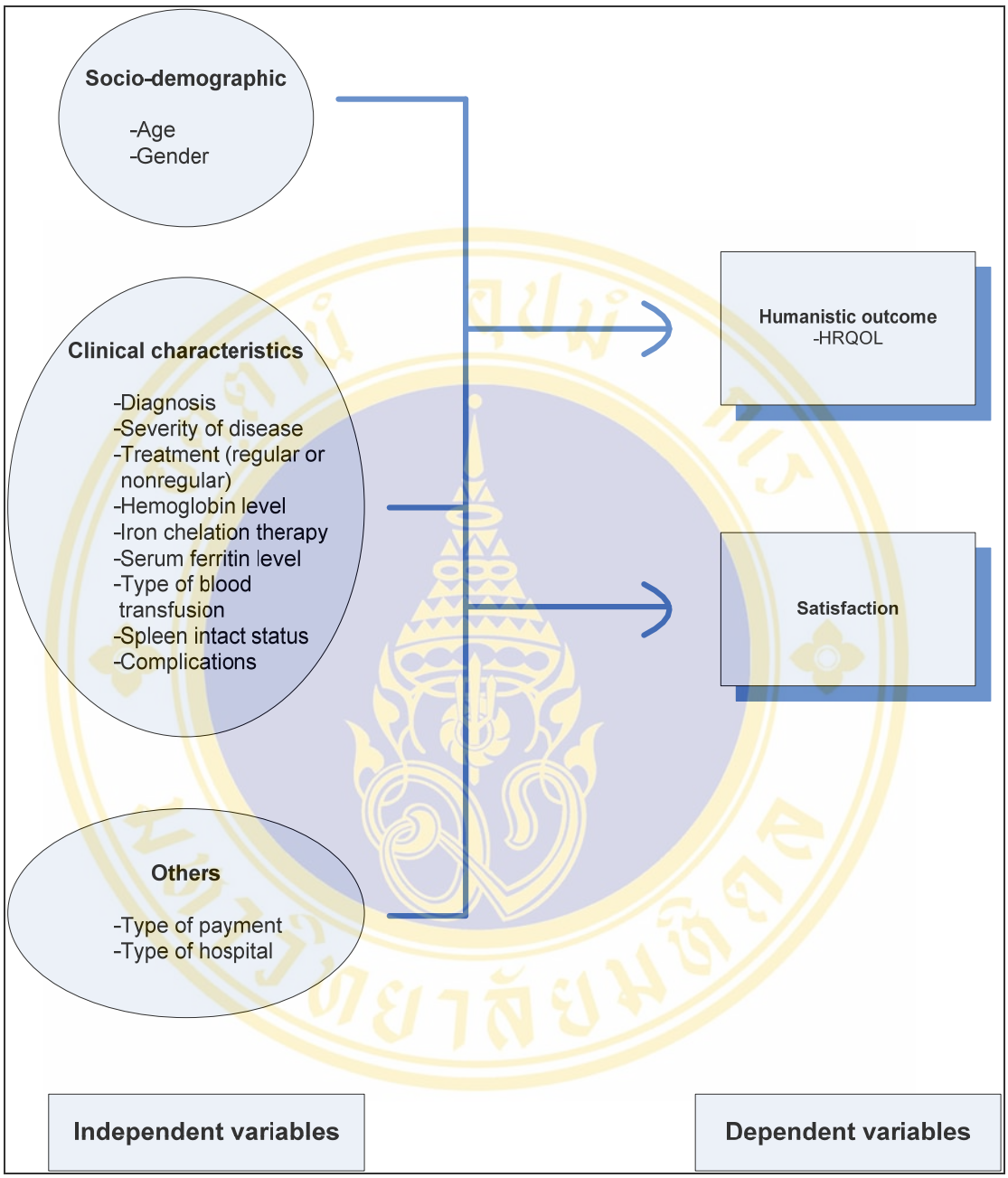

Figure 1 Conceptual framework of the research

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Hypotheses of the Study

This study has the following hypotheses:

1. Socio-demographic: age, gender and the member of self-help group are associated with the health-related quality of life of thalassemia patients.

2. Clinical characteristics: diagnosis, Hb level, Hct level, age onset of anemia, age at first transfusion, type of treatment (regular and non-regular treatment), type of blood transfusion, iron chelation therapy, serum ferritin level, spleen intact status and complications are associated with the health-related quality of life of thalassemia patients.

3. Others factors: type of hospital and type of payament are associated with the health-related quality of life of thalassemia patients.

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CHAPTER III
METHODOLOGY

Study design

Cross-sectional study of thalassemia children and adolescents between the ages of 2 and 18 years was conducted. Quality of life assessment was performed using the Pediatric Quality of Life Inventory™ (PedsQL™) 4.0 Generic Core Scale Thai version which include physical, emotional, social and role (school) functioning for child-self report (ages 5-7, 8-12, 13-18 year) and parent proxy report (ages 2-4, 5-7, 8-12, 13-18 year).

Study Setting

Outpatient thalassemia clinic of pediatric department at Phramongkutklao Hospital, King Chulalongkorn Memorial Hospital and Saraburi Hospital

Study period

During June to November 2006

Population and Sample

Outpatient thalassemia children and adolescents between the ages of 2 and 18 years, who received treatment at Phramongkutklao Hospital or King Chulalongkorn Memorial Hospital or Saraburi Hospital since 1 October 2004, were recruited in the study. The study was approved by the Hospital Ethics Committee. Written parental informed consent and child assent were obtained prior to participating in the study. The samples were selected based on the following inclusion and exclusion criteria;

Inclusion criteria

1. Patients who have a diagnosis of thalassemia diseases
2. Patients with age between 2 and 18 years old
3. Patients who have been treated at Phramongkutklao Hospital or King Chulalongkorn Memorial Hospital or Saraburi Hospital since 1 October 2004

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Exclusion criteria

1. Patients who are not willing or unable to participate into the study
2. Patients who have been taken Deferasirox (Exjade®), new iron chelator for the treatment of iron overload in thalassemia, that are under intensive clinical investigate.

Sample Size

Sample size required in the study was calculated using the formula by Lemeshow (1, 2). According to the formula, the sample size should not be smaller than 30 folds of the total number of independent variables. Since the number of independent variables in this study is approximately 13 then the sample size required is 390.

Then, the sample size for each hospital can be calculated based on the total number of eligible patients from that hospital. The sample size required for each hospital was shown below;

- Phramongkutklao Hospital: 150 patients
- King Chulalongkorn Memorial Hospital: 150 patients
- Saraburi Hospital: 100 patients

Study instrument

In this study, three questionnaires were used as the study instrument.

The health related quality of life questionnaire

The PedsQL^{TM} 4.0 (Pediatric Quality of Life Inventory^{TM}) Thai version was used for the quality of life assessment. The PedsQL^{TM} 4.0 Generic Core Scale includes parallel child-self report (age range 5-7, 8-12, 13-18 years) and parent proxy-report (age range 2-4, 5-7, 8-12, 13-18 years). The questionnaire ask how much of a problem has been for patients during the past month and responses are made on a five-point scale ranging from 0 (never a problem) to 4 (almost always a problem). The generic module comprises twenty-three items that contribute to four subscales: physical functioning, emotional functioning, social functioning and school functioning. To create the psychosocial health summary score, the mean is computed

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as the sum of the items over the number of items answered in the emotional, social, and school functioning scales. The physical health summary score is the same as the physical functioning scale score. To create the total scale score, the mean is computed as the sum of all the items over the number of items answered on all the scales. To reverse score, transform the 0-4 scale items to 0-100 as follows: 0=100, 1=75, 2=50, 3=25, and 4=0. A total scale score can also be calculated, so that higher scores indicate better health-related quality of life.

The Clinical record form

Thalassemia clinical record form was designed to facilitate the data collection process by expert opinions, pediatric hematology physicians. Demographic and clinical data since 1 October 2004 to 30 September 2005 were derived from chart review by research assistant. This questionnaire was consisted of 4 parts as follows;

Part I: Part I of the questionnaire contained demographic data of the patients (i.e. gender, age, type of payment, diagnosis, hospital name)

Part II: Part II of the questionnaire examined Hb electrophoresis/ analysis (i.e. Hb analysis method, previous blood transfusion/ history before Hb analysis, Hb type, percentage of Hb, DNA analysis)

Part III: Part III of the questionnaire examined clinical laboratory test (i.e. onset of anemia, age onset, spleen intact status, hemoglobin level, hematocrit level, type of blood transfusion, age at first transfusion, iron chelation, serum ferritin level, transfusion reaction) and complications (i.e. hemolytic crisis, gall stone, cholecystectomy, diabetes mellitus, infection, hepatitis B tests, hepatitis C tests, HIV tests, autoimmune hemolytic anemia (Coomb's test positive), heart failure)

Part IV: Part IV of the questionnaire examined recently clinical data, 3 months before interview the quality of life, of complication, hemoglobin level and iron chelation

The satisfaction questionnaire

The satisfaction questionnaire was designed to evaluate of expectation of the service and actual service received in five aspects (tangible, assurance, responsiveness, reliability, and empathy). After the questionnaire was developed, face validity and

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content validity was assessed by the group of experts. For the reliability of the questionnaire, Cronbach's alpha was equal to 0.832.

Study procedure

The PedsQL™ translation

The PedsQL™ 4.0 Thai version of aged 8-12 years was translated by local team of pediatric physicians in Chiang Mai and used for children with attention-deficit/hyperactivity disorder (ADHD) but other age range did not translate to Thai language.

The translation and linguistic validation of the PedsQL™ questionnaire followed recommended guidelines (3, 4). Two independent forward translations were conducted by two experts, bilingual pharmacists with experience from living in USA , the translators discussed semantic and conceptual discrepancies and finally developed a consensus forward translations. The translation of the first reconciled forward version of the PedsQL™ questionnaire back into the source language was done by a native English speaking person with experience from living in English speaking countries.

Pilot testing and Cognitive interviewing

Cognitive interviewing has been proposed as one of the methods used to obtain input from respondents with the aim of improving the quality of data collected from a questionnaire. Paraphrasing and the use of probing questions are some of the commonly used techniques. Cognitive interview techniques can minimize sources of measurement error introduced by the translation process by detecting question items, terms, or response options that are difficult to understand or that are misunderstood by the respondent. Cognitive interview techniques were used to obtain feedback about the interpretation and understanding of items and response ratings.

In pilot testing, convenience sampling was used. The PedsQL™ questionnaire was administrated to 3 children aged 5-7 years, 4 adolescents aged 8-12 years and 10 parents in the 2-4, 5-7 and 13-18 years age groups to test the interpretation and understanding of items and response ratings. During the interviews, probing questions were asked by the interviewer to the respondents to check whether the questions were understood as they should be. Suggestions were mainly on the choice of vocabulary

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and grammatical easy understand. The questionnaires were then revised in response to feedback from children and parents.

Data Collection

All eligible patients and their parents were approached as they came in routine follow-up at thalassemia clinic in the Department of Pediatrics of each hospital during a six-month period (June-November 2006). Somes were approached by appointment. At the beginning of the interview, all respondents were informed of the objectives of the study and be assured that all the responses were remain confidential. Written parental informed consent and child assent were obtained prior to participate in the study.

First, quality of life measurement using The PedsQL™ was performed based on its administration guideline, followed by the satisfaction questionnaire. Clinical data was collected from medical record after the patients were identified in the study.

Data analysis

Data was analyzed by Microsoft Excel 2003 and SPSS (Statistical Package for the Social Sciences) program version 13.0, as follows,

Part I Descriptive analysis

In this part, general characteristics of the patients, including socio-demographic and clinical characteristics, were described. The results were presented by percentage, mean, and standard deviation.

Part II Assessment of health related quality of life

Items on PedsQL™ were reverse-scored and linearly transformed to a 0-100 scale (0=100, 1=75, 2=50, 3=25, 4=0) so that higher scores indicated better health-related quality of life. A total scale score (derived by the mean of all 23 items) and a psychosocial health summary score (composed of the mean of items in the emotional, social, and school functioning subscales) were calculated to provide a summary of the child or adolescent's health-related quality of life.

1. The mean and standard deviation of PedsQL™ score both child self-report and parent proxy-report were presented. Also, the comparison of PedsQL™ scores,

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including total scale score, physical health summary score, and psychosocial health summary score, between child self-report and parent proxy-report was conducted using T-test. Non parametric statistic was performed if the data was not normally distributed.

2. Univariate test was used to examine relationship between selected factors and quality of life of children with thalassemia.

3. Factors influencing the quality of life of children with thalassemia were examined by multiple regression analysis. Dependent factor (Y) was the PedsQL™ total scale score of child self-report.

Part III Assessment of expectation on healthcare service

1. The number and percentage of expectation and satisfaction score were presented.

2. Chi-square was used to examine relationship between selected factors and satisfaction on healthcare service

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CHAPTER IV
RESULT

The results of this study were divided into three parts as follow;

Part 1: Demographic and clinical characteristics of thalassemia patients

Part 2: Health-related quality of life

- **Part 2.1**: Descriptive data of health-related quality of life
- **Part 2.2**: Univariate analysis in health-related quality of life
- **Part 2.3**: Multiple regression analysis in the factors affecting health-related quality of life of thalassemia patients

Part 3: Expectation and satisfaction

- **Part 3.1**: Expectation and satisfaction
- **Part 3.2**: Univariate analysis in the satisfaction

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Part 1: Demographic and clinical characteristics of thalassemia patients

Demographic and clinical characteristics of thalassemia patients

Between June and November 2006, 362 patients who met the eligibility criteria were enrolled in the study. One hundred and fifty six patients were recruited from Saraburi Hospital, 126 were from King Chulalongkorn Memorial Hospital, and 80 were from Phramongkutklao Hospital. Demographic and clinical characteristics of all patients were summarized in frequency and percentage across treatment centers, as shown in Table 2.

Table 2 Demographic and clinical characteristics of thalassemia patients

Patient characteristics	Saraburi Hospital	King Chulalongkorn Memorial Hospital	Phramongkutklao Hospital	Total
	N (%)	N (%)	N (%)	N (%)
Gender (N=361)				
Male	77 (49.4%)	68 (54.4%)	42 (52.5%)	187 (51.8%)
Female	79 (50.6%)	57 (45.6%)	38 (47.5%)	174 (48.2%)
Current education level (N=362)				
Not attending school	8 (5.1%)	4 (3.2%)	3 (3.7%)	15 (4.1%)
Kindergarten	27 (17.3%)	17 (13.5%)	10 (12.5%)	54 (14.9%)
Primary school	77 (49.4%)	72 (57.1%)	32 (40.0%)	181 (50.0%)
Secondary or high school	44 (28.2%)	33 (26.2%)	33 (41.3%)	110 (30.4%)
Diploma degree	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Bachelor degree	0 (0%)	0 (0%)	2 (2.5%)	2 (0.6%)
Type of payment (N=362)				
Universal Coverage Scheme (UC)	133(85.2%)	38 (30.1%)	35 (43.7%)	206 (56.9%)
Civil Servant Medical Benefit Scheme (CSMBS)	14 (9.0%)	22 (17.5%)	25 (31.3%)	61 (16.9%)
Out of pocket	9 (5.8%)	66 (52.4%)	20 (25.0%)	95 (26.2%)
Member of self-help group (N=362)				
Yes	4 (2.6%)	26 (20.6%)	4 (5.0%)	34 (9.4%)
No	152 (97.4%)	100 (79.4%)	76 (95.0%)	328 (90.6%)
Diagnosis (N=357)				
Beta-thalassemia/Hb E	68 (43.6%)	85 (70.2%)	37 (46.2%)	190 (53.2%)
Homozygous beta- thalassemia	4 (2.6%)	10 (8.3%)	5 (6.3%)	19 (5.3%)
HbH	84 (53.8%)	26 (21.5%)	38 (47.5%)	148 (41.5%)
Spleen intact status (N=360)				
Spleen intact	29 (18.7%)	28 (22.4%)	22 (27.5%)	79 (21.9%)
No spleen intact	126 (81.3%)	97 (77.6%)	58 (72.5%)	281 (78.1%)

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Table 2 Demographic and clinical characteristics of thalassemia patients (continued)

Patient characteristics	Saraburi Hospital	King Chulalongkorn Memorial Hospital	Phramongkutklao Hospital	Total
	N (%)	N (%)	N (%)	N (%)
Type of blood transfusion (N=359)				
No	90 (57.7%)	37 (30.1%)	37 (46.3%)	164 (45.7%)
Occasional (1-5 times/year)	40 (25.6%)	25 (20.3%)	4 (5.0%)	69 (19.2%)
Low (6-12 times/year)	25 (16.0%)	35 (28.5%)	28 (35.0%)	88 (24.5%)
High (13-22 times/year)	1 (0.5%)	26 (21.1%)	11 (13.7%)	38 (10.6%)
Iron chelation (N=361)				
Yes (Desferrioxamine)	6 (3.8%)	63 (50.4%)	31 (38.7%)	100 (27.7%)
No	150 (96.2%)	62 (49.6%)	49 (61.3%)	261 (72.3%)
Reported complications				
No	151 (96.8%)	126 (100%)	60 (75.0%)	337 (93.1%)
Yes				
Gall stone (N=242)	1 (0.6%)	0 (0%)	2 (2.5%)	3 (1.2%)
Cholecystectomy (N=344)	2 (1.3%)	0 (0%)	1 (1.3%)	3 (0.9%)
Hepatitis B infection (N=361) :Anti-HBs positive	0 (0%)	0 (0%)	17 (21.3%)	17 (21.3%)
Hepatitis C infection (N=361) :Anti-HCV positive	1 (0.6%)	0 (0%)	1 (1.3%)	2 (0.6%)
Autoimmune hemolytic anemia (Coomb's test positive) (N=361)	0 (0%)	0 (0%)	2 (2.5%)	2 (0.6%)
Heart failure (N=361)	2 (1.3%)	0 (0%)	0 (0%)	2 (0.6%)

According to Table 2, the total number of male patients in the study was almost the same amount as that of female patients (51.8% and 48.2%, respectively). One hundred and eighty-one patients (50%) were studying in primary school, 110 patients were (30.4%) in secondary school, 54 (14.9%) were in kindergarten, and 2 (0.6%) were in university. Of the 15 patients who were not attending school, 13 patients were too young to go school, 1 patient dropped out from school, while one patient had never attended school. When looking at type of health insurance, it was found that approximately 57 percent of the patients were covered by Universal Coverage Scheme. Around 17% of the patients (61/362) were under Civil Servant Medical Benefit Scheme (CSMBS), while about 26% (95/362) of the patients were out of pocket. Almost all of the patients (90%) were not member of the self-help group. About 53.2%, 41.5% %, and 5.3% of the patients were diagnosed as having Beta-thalassemia/Hb E, Hb H, and homozygous beta-thalassemia, respectively. Two hundred and eighty-one patients (78.1%) have spleen intact. One hundred and sixty-four (45.7%) did not receive blood transfusion. Sixty-nine (19.2%), 88 (24.5%), and

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38 (10.6%) patients received occasional (1-5 times/year), low (6-12 times/year), and high (more than 13 times/year) transfusion, respectively. One hundred patients (27.7%) were given iron chelation, desferrioxamine (DFO) or desferal® injection, to remove the excess iron from their blood. Complication was rarely found, with 25 (6.9%) patients had complication. The most frequent found complications were anti-HBs positive (n = 17; 21.3%), gallstone (n = 3; 1.2%), cholecystectomy (n = 3; 0.9%), anti-HCV positive (n = 2; 0.6%), autoimmune hemolytic anemia (n = 2; 0.6%), and heart failure (n = 2; 0.6%). Age and clinical characteristics of the patients were further summarized in term of means and standard deviation (SD) across treatment centers, as shown in Table 3.

Table 3 Age and clinical characteristics of thalassemia patients

Patient characteristics	Saraburi Hospital	King Chulalongkorn Memorial Hospital	Phramongkutklao Hospital	Total
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age (Year) (N=362)	9.13 (3.66)	8.95 (3.54)	10.56 (4.07)	9.39 (3.76)
Age onset of anemia (Year) (N=312)	3.75 (2.42)	2.70 (2.30)	3.35 (2.88)	3.38 (2.54)
Age at first transfusion (Year) (N=220)	3.82 (2.82)	3.40 (2.51)	3.77 (2.70)	3.70 (2.71)
Pre-transfusion Hb level (g/dL) (N=346)	7.76 (1.09)	7.41 (1.07)	8.16 (0.86)	7.74 (1.07)
Pre-transfusion Hb level during the past 3 months before assessing QOL (g/dL) (N=310)	7.79 (1.17)	8.26 (1.31)	8.33 (1.02)	8.05 (1.19)
Hct level (%) (N=233)	24.80 (4.05)	-*	27.05 (3.29)	25.55 (3.95)
Serum ferritin level (ng/ml) (N=209)	1454.99 (1671.87)	2647.84 (1725.58)	2447.23 (2053.88)	2373.16 (1856.46)
Transfused blood volume/year (ml) (N=192)	995.30 (734.07)	2673.77 (1550.85)	2926.59 (1249.89)	2150.78 (1510.16)
Transfused blood volume/bodyweight (ml/kg) (N=147)	47.32 (32.73)	105.92 (74.64)	113.19 (45.70)	81.59 (59.43)

* Hct level test was not performed at King Chulalongkorn Memorial Hospital

According to Table 3, the mean age of the patients was 9.39 ± 3.76 years old. It was found that patients who received treatment at Phramongkutklao hospital were slightly older than patients received treatment at other hospitals. The age of the patients ranged from 2 to 18 years old. The mean age onset of the patients was 3.38 ± 2.54 years old. On the other hand, the mean age at first transfusion of 220 patients

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was 3.7 ± 2.71 years old. Overall, age onset and age at first transfusion of the patients were quite similar across treatment centers.

Normally, the hemoglobin (Hb) level in pediatric was 11-14 g/dL (1). Overall, the average pre-transfusion Hb level in this study ranged from 4.7 to 11.2 g/dL with the mean and SD of 7.74 and 1.07 g/dL, respectively. It was found that an average Hb level of patients received treatment at Saraburi Hospital and King Chulalongkorn Memorial Hospital was approximately 7 g/dL while that of patients who received treatment at Phramongkutklao Hospital was around 8 g/dL.

When looking at hematocrit (Hct) level, which also indicated the severity of disease, it was found that an average Hct level of the patients in this study ranged from 16.77 to 38.3% with the mean and SD of 25.55% and 3.95%, respectively. For King Chulalongkorn Memorial Hospital, no data Hct level were available. It was found that Hct level of the patients who were treated at Phramongkutklao Hospital was, somewhat, higher than that of patients who were treated at Saraburi Hospital.

The serum ferritin level served as an indicator for iron overload, which led to serious complications (2-4). If the serum ferritin level is higher than 1000 ng/ml, the patients will be treated with iron chelation therapy. As shown in table 4, the mean (SD) of serum ferritin level of the patients in this study was 2373.16 (1856.46) ng/ml with the range from 23 to 8963 ng/ml. It was also found that the serum ferritin level of the patients who were treated at Saraburi Hospital was lower than that of the patients treated at other treatment centers.

The mean of transfused blood volume/year of the patients who received blood transfusion was shown in Table 3. It was found that the mean (SD) blood volume of the patients treated at Saraburi Hospital, King Chulalongkorn Memorial Hospital and Phramongkutklao Hospital was 995.30 (734.07), 2673.77 (1550.85) and 2926.59 (1249.89) ml/year, respectively. The overall average blood volume of the patients was 2150.78 ± 1510.16 ml/year. When looking at the volume of transfused blood per bodyweight, the mean (SD) of transfused blood volume per bodyweight of the patients who received transfustion at Saraburi Hospital, King Chulalongkorn Memorial Hospital and Phramongkutklao Hospital was 47.32 (32.73), 105.92 (74.64) and 113.19 (45.70) ml/kg, respectively. The overall average transfused blood volume of the patients was 81.59 ± 59.43 ml/kg.

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Clinical characteristics during the past 3 months before assessing the health-related quality of life

Since clinical data was of the patients were collected retrospectively during October 1, 2004 to September 30, 2005, however, information on health-related quality of life (HRQOL) was assessed between June and November 2006. For better assessing factors affecting health related quality of life, some important and changeable clinical data were then collected again during the past 3 months before assessing the health-related quality of life. Clinical characteristics of the patients during the past 3 months before assessing the HRQOL were summarized in term of frequency and percentage across treatment centers, as shown in Table 4. For complication, it was found that during the past 3 months before assessing HRQOL, a majority (99.4%) of the patients had no complication. Of those having complication, one had heart disease, iron overload and bone fracture and one had hepatitis infection and gallstone. When looking at the Hb level, it was found that a majority (60.6%) of 310 patients had the mean Hb level ranged between 7 and 9 g/dL. Sixty-six (21.3%) patients had pre-transfusion Hb level higher than 9 g/dL while fifty-six (18.1%) patients had pre-transfusion Hb level less than 7 g/dL. The mean(SD) of pre-transfusion Hb level during the past 3 months before assessing QOL was about 8.05 (1.19) g/dL, as shown in Table 4. When looking at the treatment center, it was found that the mean (SD) of Hb level of patient who recruited from Saraburi Hospital, King Chulalongkorn Memorial Hospital and Phramongkutklao Hospital was 7.79 (1.17), 8.26 (1.31) and 8.33 (1.02), respectively. For iron overload treatment, approximately 79% (243/308) of the patients did not receive iron chelation, while about 65 (21.1%) patients were given iron chelation, desferrioxamine, by subcutaneous injection.

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Table 4 Clinical characteristics of thalassemia patients during the past 3 months before assessing the health-related quality of life

Clinical characteristics	Saraburi Hospital	King Chulalongkorn Memorial Hospital	Phramongkutklao Hospital	Total
	N (%)	N (%)	N (%)	N (%)
Complications (N=342)				
No	154 (98.8%)	106 (100%)	80 (100%)	340 (99.4%)
Yes				
Heart disease, iron overload, bone fracture	1 (0.6%)	0 (0%)	0 (0%)	1 (0.3%)
Hepatitis infection, Gall stone	1 (0.6%)	0 (0%)	0 (0%)	1 (0.3%)
Pre-transfusion Hb level (N=310)				
>9 g/dL	26 (16.9%)	21 (27.6%)	19 (23.8%)	66 (21.3%)
7-9 g/dL	91 (59.1%)	43 (56.6%)	54 (67.5%)	188 (60.6%)
<7 g/dL	37 (24.0%)	12 (15.8%)	7 (8.8%)	56 (18.1%)
Iron chelation (N=325)				
No	150 (97.4%)	52 (53.1%)	41 (73.2%)	243 (78.9%)
Yes				
Desferrioxamine	4 (2.6%)	46 (46.9%)	15 (26.8%)	65 (21.1%)

In this study, severe thalassemia patients were defined as 1) patients whose onset of anemia were less than 2 years of age and the first transfusion occurred before 4 years of age, 2) patients who had diagnosed with homozygous beta-thalassemia, or 3) patients who had pre-transfusion Hb level lower than 7 g/dL. According to these criteria, it was found that 238 patients (65.7%) were non-severe while 124 patients (34.3%) were severe. For Saraburi Hospital, 99 (63.5%) and 57 (36.5%) patients were classified into non-severe and severe, respectively. For King Chulalongkorn Memorial Hospital, 78 (61.9%) and 48 (38.1%) patients were classified into non-severe and severe disease, respectively. For Phramongkutklao Hospital, 61 (76.3%) and 19 (23.8%) patients were classified into non-severe and severe disease,

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respectively. For Phramongkutklao Hospital, 61 (76.3%) and 19 (23.8%) patients were classified into non-severe and severe disease, respectively. (see Table 5)

Table 5 Severity of diseases across treatment center

Group of severity of disease	Saraburi Hospital	King Chulalongkorn Memorial Hospital	Phramongkutklao Hospital	Total
	N (%)	N (%)	N (%)	N (%)
Non-severe	99 (63.5%)	78 (61.9%)	61 (76.3%)	238 (65.7%)
Severe*	57 (36.5%)	48 (38.1%)	19 (23.8%)	124 (34.3%)

*severe thalassemia patients were defined as patients whose onset of anemia were before 2 years of age and the first transfusion occurred before 4 years of age, or patients who had diagnosed with Homozygous beta-thalassemia or patients who had pre-transfusion Hb level lower than 7 g/dL.

When looking at treatment received, patients who received non-regular treatment in this study were defined as follows;

1. The patients whose pre-transfusion Hb level were lower than 7 g/dL, who received no blood transfusion
2. The patients whose serum ferritin level were higher than 1000 ng/ml, who received no iron chelation therapy
3. The patients whose onset of anemia were before 2 years of age and received the first transfusion before 4 years of age, who did not receive high transfusion.
4. The patients diagnosed with homozygous beta-thalassemia who did not receive high transfusion

Using the criteria mentioned above, it was found that 263 patients (73.5%) received regular treatment while 95 patients (26.5%) received non-regular treatment. Table 6 displayed the number of patients received regular and non-regular treatment across treatment centers. This study found that 104 patients (67.5%), 99 patients (78.6%), and 60 patients (76.9%) who were treated at Saraburi Hospital, King Chulalongkorn Memorial Hospital, and Phramongkutklao Hospital received regular treatment, respectively.

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Table 6 Type of treatment in thalassemia patients by treatment center

Type of treatment	Hospital (N=358)			Total
	Saraburi Hospital	King Chulalongkorn Memorial Hospital	Phramongkutklao Hospital	
	N (%)	N (%)	N (%)	N (%)
Regular treatment	104 (67.5%)	99 (78.6%)	60 (76.9%)	263 (73.5%)
Non-regular treatment	50 (32.5%)	27 (21.4%)	18 (23.1%)	95 (26.5%)

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Part 2: Health-related quality of life

Of 362 patients whose clinical data were collected, 3 patients did not complete the interview (did not return the PedsQL 4.0 for parent proxy-report), 1 patient was deaf, and 11 patients were on oral iron chelator, deferasirox. As the result, information of HRQOL of was obtained from only 347 patients.

Descriptive data of the health-related quality of life

Quality of life of 347 children with thalassemia was assessed using Thai version of PedsQL 4.0 generic core scale.

Table 7 and 8 present the means and standard deviations of the PedsQL 4.0 scores for child self-report and parent proxy-report, respectively. The 23-item PedsQL generic core scale encompasses the following 5 dimension; physical functioning (8 items), emotional functioning (5 items), social functioning (5 items), and school functioning (5 items). A 5-point response scale was used (0 = never a problem; 4 = almost always a problem). Items are reverse-scored and linearly transformed to a 0 to 100 scale (0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0), so that higher scores indicate better health-related quality of life.

The internal consistency reliabilities were good with Cronbach's alphas of 0.819 (Total score of child self-report; N = 314) and 0.886 (Total score of parent proxy-report; N = 346), respectively.

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Table 7 PedsQL 4.0 Generic Core Scale for child self-report

PedsQL 4.0 Generic Core Scales Item Content	Child self-report	
	N	Mean ± SD
Physical Functioning (problems with…)		
1. It is hard for me to walk more than one block	315	84.76 ± 23.56
2. It is hard for me to run	315	72.62 ± 28.19
3. It is hard for me to do sports activity or exercise	315	78.33 ± 28.16
4. It is hard for me to lift something heavy	315	64.13 ± 30.89
5. It is hard for me to take a bath or shower by myself	315	96.03 ± 14.94
6. It is hard for me to do chores around the house	315	89.21 ± 18.68
7. I hurt or ache	315	72.06 ± 26.27
8. I have low energy	315	68.81 ± 26.79
Emotional Functioning (problems with…)		
1. I feel afraid or scared	315	71.98 ± 29.64
2. I feel sad or blue	315	79.37 ± 25.68
3. I feel angry	315	69.21 ± 28.08
4. I have trouble sleeping	315	80.00 ± 26.49
5. I worry about what will happen me	315	78.97 ± 25.00
Social Functioning (problems with…)		
1. I have trouble getting along with other kids	315	89.29 ± 21.17
2. Other kids do not want to be my friend	315	88.02 ± 21.98
3. Other kids tease me	315	76.11 ± 27.91
4. I cannot do things that other kids my age can do	315	81.67 ± 22.91
5. It is hard to keep up when I play with other kids	315	83.49 ± 25.03
School Functioning (problems with…)		
1. It is hard to pay attention in class	314	81.90 ± 23.73
2. I forget things	314	67.78 ± 28.59
3. I have trouble keeping up with my schoolwork	314	79.14 ± 25.65
4. I miss school because of not feeling well	314	64.09 ± 26.18
5. I miss school to go to the doctor or hospital	314	47.77 ± 23.37

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Table 8 PedsQL 4.0 Generic Core Scale for parent proxy-report

PedsQL 4.0 Generic Core Scales Item Content	Parent proxy-report	
	N	Mean ± SD
Physical Functioning (problems with…)		
1. Walking more than one block	347	84.29 ± 24.75
2. Running	347	73.92 ± 26.76
3. Participating in sports activity or exercise	347	71.61 ± 27.17
4. Lifting something heavy	347	69.52 ± 27.78
5. Taking a bath or shower by him or herself	347	87.90 ± 27.10
6. Doing chores around the house	347	81.63 ± 25.42
7. Having hurts or aches	347	70.24 ± 25.12
8. Low energy level	347	69.02 ± 26.03
Emotional Functioning (problems with…)		
1. Feeling afraid or scared	347	69.81 ± 27.32
2. Feeling sad or blue	347	77.74 ± 24.48
3. Feeling angry	347	59.29 ± 23.93
4. Trouble sleeping	347	84.51 ± 23.27
5. Worrying about what will happen to him or her	347	77.74 ± 25.78
Social Functioning (problems with…)		
1. Getting along with other children	347	86.60 ± 25.79
2. Other kids not wanting to be his or her friend	347	90.71 ± 17.78
3. Getting teased by other children	347	83.72 ± 23.85
4. Not able to do things that other children his or her age can do	347	84.73 ± 22.10
5. Keeping up when playing with other children	347	79.76 ± 27.72
School Functioning (problems with…) (ages 5-7, 8-12, 13-18)		
1. Paying attention in class	314	75.56 ± 28.43
2. Forgetting things	314	66.00 ± 25.68
3. Keeping up with schoolwork	314	75.08 ± 28.51
4. Missing school because of not feeling well	314	67.68 ± 26.48
5. Missing school to go to the doctor or hospital	314	47.45 ± 21.93
For ages 2-4 School Functioning (problems with…)		
1. Keeping up with activities	22	94.32 ± 15.30
2. Missing school (or nursery) because of not feeling well	22	63.64 ± 26.42
3. Missing school (or nursery) to go to the doctor or hospital	22	51.14 ± 28.32

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A physical functioning score and a psychosocial health summary score (composed of the mean of items in the emotional, social, and school functioning subscales) were, further, calculated to provide a summary of the child or adolescent's health-related quality of life in each domain.

Table 9 demonstrated the comparison between the PedsQL 4.0 for child self-report and parent proxy-report of children ages 5-18 years in terms of total scale score, physical functioning score, and psychosocial health summary score. As shown in Table 9, the mean (±SD) of total scale score, and physical functioning score of children-rated HRQOL were 76.67 (±11.40), and 78.24 (±14.77), respectively. In psychosocial domain, school functioning scored the least 67.89 (±15.92), followed by emotional functioning 75.90 (± 16.62) and social functioning 83.71 (± 14.73), respectively.

According to Table 9, significant difference in HRQOL scores was found. The result showed that for all scales except social functioning and school functioning, children with thalassemia reported significantly higher HRQOL than their parents.

Table 9 PedsQL 4.0 Generic Core Scale in child self-report compared to parent proxy-report

Scale	Child self-report (N=315)	Parent proxy-report (N=315)	p-value [a]
	Mean ± SD	Mean ± SD	
Total summary score	76.67 ± 11.40	74.69 ± 14.42	0.016*
Physical Functioning	78.24 ± 14.77	74.94 ± 18.31	0.001*
Psychosocial Health	75.54 ± 12.76	74.56 ± 14.53	0.015*
Emotional Functioning	75.90 ± 16.62	73.21 ± 17.31	0.020*
Social Functioning	83.71 ± 14.73	84.33 ± 16.87	0.278
School Functioning	67.89 ± 15.92	66.14 ± 18.48	0.221

Report for children aged 2-4 years were not included

a: Wilcoxon Signed Ranks Test, * Significant difference

Table 10 presented the comparison of the PedsQL 4.0 score across age group for child self-report and parent proxy-report. For child self-report, it was found that adolescent reported higher HRQOL than younger patients. For parent proxy-report, it

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was found that toddler age 2-4 years reported having the highest HRQOL level, as compared to the other age groups.

Table 10 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age group

Scale	Age group			
	Toddler 2-4	Young child 5-7	Child 8-12	Adolescent 13-18
Child self-report (N=315)		(N = 63)	(N = 153)	(N = 99)
Total Score	-	73.91 ± 11.80	75.51 ± 11.34	80.23 ± 10.44
Physical Functioning	-	74.80 ± 16.57	77.82 ± 14.83	81.09 ± 12.96
Psychosocial Health	-	73.44 ± 13.10	74.17 ± 12.57	78.99 ± 12.26
Emotional Functioning	-	73.17 ± 19.25	75.03 ± 16.36	78.99 ± 14.83
Social Functioning	-	82.06 ± 17.15	81.70 ± 14.77	87.88 ± 12.04
School Functioning	-	65.08 ± 16.35	66.11 ± 16.41	72.42 ± 13.97
Parent proxy-report (N=347)	(N = 32)	(N = 63)	(N = 153)	(N = 99)
Total Score	80.92 ± 14.09	73.41 ± 14.47	73.38 ± 15.35	77.54 ± 12.52
Physical Functioning	86.62 ± 16.19	73.91 ± 18.21	74.41 ± 18.73	76.42 ± 17.80
Psychosocial Health	83.59 ± 12.94	73.15 ± 14.26	72.83 ± 15.45	78.13 ± 12.61
Emotional Functioning	79.84 ± 13.82	72.30 ± 17.66	71.50 ± 18.43	76.41 ± 14.83
Social Functioning	92.66 ± 13.38	82.62 ± 16.19	83.17 ± 17.88	87.22 ± 15.44
School Functioning*	69.70 ± 20.01	64.52 ± 18.59	63.82 ± 18.65	70.76 ± 17.44

Values are presented as Mean ± SD

*only 22 patients in toddler group (2-4 years old) were analyzed for school functioning since the other 10 patients had not attended school/ nursery

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Univariate analysis in the quality of life

1. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age group
2. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by pre-transfusion hemoglobin (Hb) level
3. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by hematocrit (Hct) level
4. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by type of blood transfusion
5. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age onset of anemia
6. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age at first transfusion
7. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by serum ferritin level
8. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by diagnosis
9. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by complications
10. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by type of payment
11. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by membership of self-help group
12. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by iron chelation therapy
13. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by treatment center
14. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by type of hospital
15. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by spleen intact status

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16. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by treatment status (regular and non-regular treatment)

17. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by Hb level in the past 3 months before assessing QOL

19. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by gender

20. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by severity of disease (severe and non-severe)

21. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by group of severity of disease and treatment center

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1. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age group

Table 11 demonstrated the comparison of the PedsQL 4.0 score across age group for child self-report and parent proxy-report. It was found that the total, physical, and psychosocial scores were found to be significant different across age group. Younger children with thalassemia seemed to report lower HRQOL than the older age group. Similarly, significant differences were also found in the total, physical, and psychosocial scores of their parent-rated HRQOL scores.

Table 11 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age group

Scale	Age group				
	Toddler (age 2-4 y)	Young child (age 5-7 y)	Child (age 8-12 y)	Adolescent (age 13-18 y)	p-value [a]
Child self-report (N=315)		(N = 63)	(N = 153)	(N = 99)	
Total Score	-	73.91 ± 11.80	75.51 ± 11.34	80.23 ± 10.44	0.001 *
Physical Functioning	-	74.80 ± 16.57	77.82 ± 14.83	81.09 ± 12.96	0.054 *
Psychosocial Health	-	73.44 ± 13.10	74.17 ± 12.57	78.99 ± 12.26	0.003 *
Parent proxy-report (N=347)	(N = 32)	(N = 63)	(N = 153)	(N = 99)	
Total Score	80.92 ± 14.09	73.41 ± 14.47	73.38 ± 15.35	77.54 ± 12.52	0.008 *
Physical Functioning	86.62 ± 16.19	73.91 ± 18.21	74.41 ± 18.73	76.42 ± 17.80	0.001 *
Psychosocial Health	83.59 ± 12.94	73.15 ± 14.26	72.83 ± 15.45	78.13 ± 12.61	< 0.001 *

a: Kruskal-Wallis Test, * Significant difference

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2. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by pre-transfusion hemoglobin level

Table 12 displays the comparison of score of the PedsQL 4.0 across pre-transfusion Hb level measured between October 1, 2004 and September 30, 2005 for child self-report and parent proxy-report. According to Table 12, significant differences in HRQOL scores were found across pre-transfusion Hb level. The result revealed that HRQOL scores were significantly associated with degree of anemia. For both children-rated and parent-rated HRQOL, patients who had higher Hb level had significantly higher HRQOL score than patients who had lower Hb level in all domains.

Table 12 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by pre-transfusion hemoglobin (Hb) level

Scale	Hemoglobin level			
	Hb < 7 g/dL	Hb 7-9 g/dL	Hb > 9 g/dL	p-value [a]
Child self-report (N=300)	(N = 72)	(N = 195)	(N = 33)	
Total Score	74.14 ± 11.86	76.78 ± 11.26	80.01 ± 10.30	0.042 *
Physical Functioning	75.39 ± 15.64	78.13 ± 14.52	82.86 ± 13.76	0.054 *
Psychosocial Health	74.73 ± 11.10	74.83 ± 13.47	81.06 ± 9.93	0.028 *
Parent proxy-report (N=331)	(N = 80)	(N = 213)	(N = 38)	
Total Score	72.78 ± 15.10	74.85 ± 14.49	82.03 ± 10.49	0.004 *
Physical Functioning	71.91 ± 22.41	76.19 ± 17.23	82.24 ± 14.13	0.016 *
Psychosocial Health	73.93 ± 14.17	74.64 ± 15.06	82.42 ± 10.26	0.006 *

a: Kruskal-Wallis Test, * Significant difference

From the scatter plot (Figure 2), positive relationship between the total mean QOL score (child self-report) and Hb level for total patients was found ($R^2 = 0.026$, p-value = 0.005).

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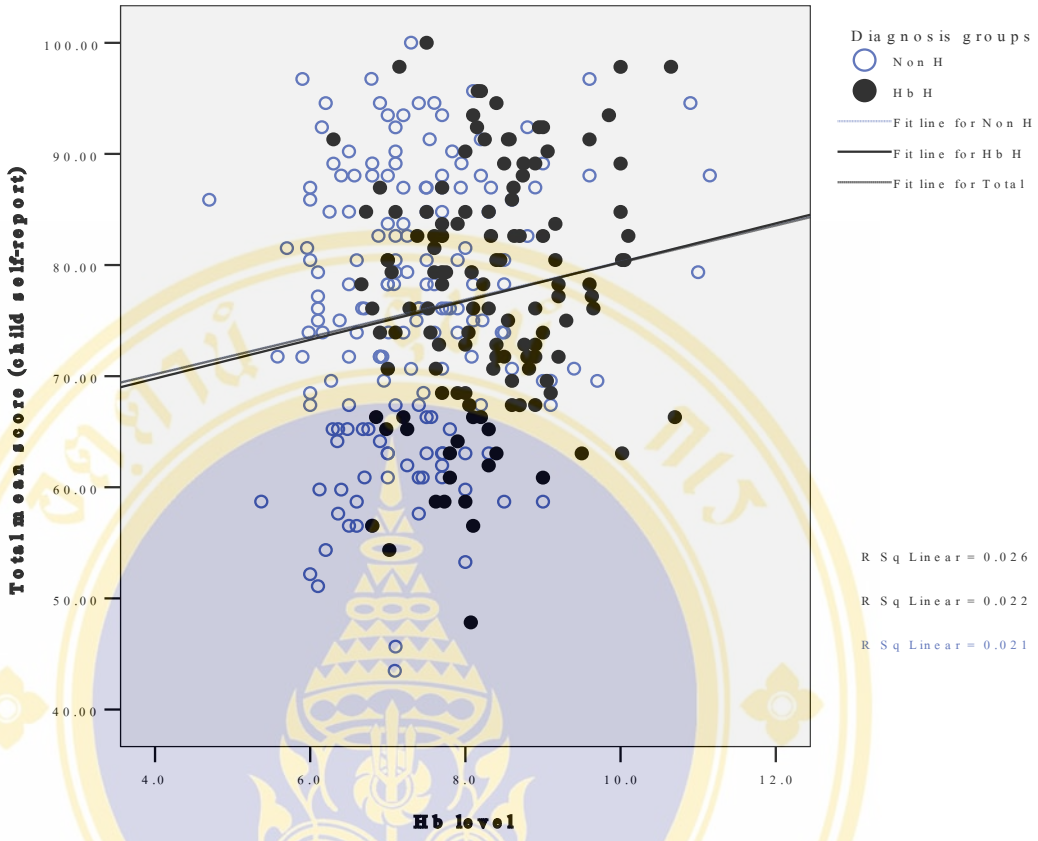

Figure 2 Scatter plot between total mean QOL score for child self-report and pre-transfusion Hb level

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3. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by hematocrit level

Table 13 described the comparison of score of the PedsQL 4.0 across hematocrit level for child self-report and parent proxy-report. According to Table 13, significant differences in all domains of parent-rated and psychosocial domain of children-rated were found across hematocrit level. The result revealed that patients, who had higher Hct level were more likely to report significantly higher HRQOL scores than patients who had lower Hct level.

Table 13 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by hematocrit (Hct) level

Scale	Hematocrit level			
	Hct < 22%	Hct 22-29%	Hct > 29%	p-value [a]
Child self-report (N=201)	(N = 39)	(N = 125)	(N = 37)	
Total Score	74.36 ± 10.79	76.04 ± 11.85	79.99 ± 9.81	0.078
Physical Functioning	75.80 ± 15.60	78.05 ± 15.32	82.43 ± 14.06	0.203
Psychosocial Health	73.03 ± 11.23	74.27 ± 13.54	81.85 ± 8.12	0.002 *
Parent proxy-report (N=218)	(N = 45)	(N = 130)	(N = 43)	
Total Score	69.96 ± 15.80	73.56 ± 15.09	82.93 ± 9.50	<0.001 *
Physical Functioning	67.92 ± 24.19	74.52 ± 17.74	83.94 ± 12.71	0.002 *
Psychosocial Health	72.76 ± 15.18	73.32 ± 15.82	82.77 ± 10.05	0.001 *

a: Kruskal-Wallis Test, * Significant difference

From the scatter plot (Figure 3), positive relationship between the total mean QOL score (child self-report) and Hct level for total patients was found ($R^2 = 0.057$, p-value = 0.001).

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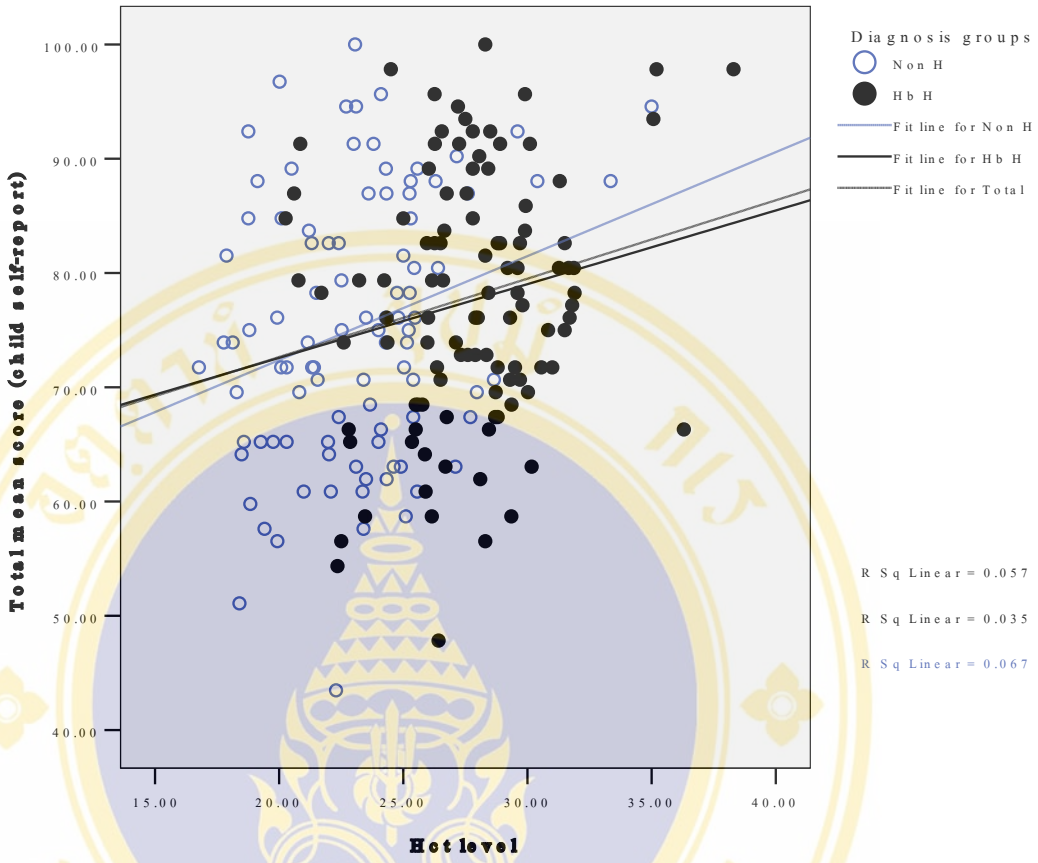

Figure 3 Scatter plot between total mean QOL score for child self-report and Hct level

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4. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by type of blood transfusion

Table 14 presented the comparison of the PedsQL 4.0 score across type of blood transfusion for child self-report and parent proxy-report. According to Table 14, patients who received no transfusion had higher HRQOL scores than those who received blood transfusion, however, no significant difference in HRQOL scores was found.

Table 14 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by type of blood transfusion

Scale	Type of blood transfusion				
	No	Occasional (1-5 times/year)	Low (6-12 times/year)	High (13-18 times/year)	p-value [a]
Child self-report (N=312)	(N = 146)	(N = 58)	(N = 77)	(N = 31)	
Total Score	78.05 ± 10.77	76.52 ± 10.86	75.06 ± 11.97	76.44 ± 12.38	0.420
Physical Functioning	79.77 ± 13.25	78.50 ± 15.77	76.70 ± 15.52	76.92 ± 16.00	0.620
Psychosocial Health	76.76 ± 12.53	74.37 ± 12.40	74.13 ± 13.78	76.45 ± 11.51	0.449
Parent proxy-report (N=344)	(N = 160)	(N = 69)	(N = 81)	(N = 34)	
Total Score	77.02 ± 13.98	72.50 ± 15.04	74.33 ± 14.93	75.98 ± 14.04	0.163
Physical Functioning	78.36 ± 16.79	71.60 ± 19.70	75.81 ± 19.36	75.91 ± 19.80	0.133
Psychosocial Health	76.79 ± 14.37	74.27 ± 15.73	73.54 ± 14.72	76.56 ± 12.64	0.398

a: Kruskal-Wallis Test

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5. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age onset

Table 15 displayed the comparison of score of the PedsQL 4.0 across onset of anemia for child self-report and parent proxy-report. According to table 15, unlike parent-rated HRQOL scores and child self-report on psychosocial health, children-rated on total score and physical functioning score were significantly associated with onset of anemia. It was found that patients whose onset of anemia started before 2 years of age had lower HRQOL scores than patients whose onset of anemia started after 2 years of age.

Table 15 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age onset of anemia

Scale	Age onset			
	age > 10 year	age 2-10 year	age < 2 year	p-value [a]
Child self-report (N=270)	(N = 8)	(N = 186)	(N = 76)	
Total Score	79.89 ± 12.46	77.57 ± 11.17	73.80 ± 11.42	0.043 *
Physical Functioning	85.16 ± 10.92	79.13 ± 14.91	74.75 ± 15.58	0.040 *
Psychosocial Health	83.44 ± 7.70	76.17 ± 12.18	73.55 ± 13.60	0.071
Parent proxy-report (N=297)	(N = 8)	(N = 196)	(N = 93)	
Total Score	80.71 ± 12.39	75.75 ± 14.04	74.51 ± 15.37	0.501
Physical Functioning	81.64 ± 14.98	75.94 ± 18.87	75.67 ± 18.02	0.721
Psychosocial Health	80.21 ± 13.99	75.90 ± 13.68	75.31 ± 16.21	0.574

a: Kruskal-Wallis Test, * Significant difference

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6. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age at first transfusion

Table 16 depicted the comparison of score of the PedsQL 4.0 across age at first transfusion for child self-report and parent proxy-report. According to Table 16, no significant difference in HRQOL scores was found across age at first transfusion.

Table 16 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by age at first transfusion

Scale	Age at first transfusion			
	age < 4 year	age 4-10 year	age > 10 year	p-value [a]
Child self-report (N=191)	(N = 94)	(N = 89)	(N = 8)	
Total Score	73.88 ± 11.32	77.02 ± 11.81	73.23 ± 13.21	0.128
Physical Functioning	74.77 ± 15.37	79.28 ± 15.14	78.91 ± 12.47	0.125
Psychosocial Health	74.91 ± 12.70	73.91 ± 13.29	73.02 ± 10.33	0.712
Parent proxy-report (N=206)	(N = 107)	(N = 91)	(N = 8)	
Total Score	74.70 ± 13.85	72.89 ± 15.14	71.06 ± 10.18	0.456
Physical Functioning	74.39 ± 17.32	73.94 ± 19.33	71.48 ± 13.51	0.803
Psychosocial Health	75.85 ± 14.50	72.34 ± 15.08	70.83 ± 12.60	0.128

a: Kruskal-Wallis Test

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7. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by serum ferritin level

Table 17 described the comparison of the PedsQL 4.0 score across serum ferritin level, indicator for iron overload status, for child self-report and parent proxy-report. According to table 17, parent-rated physical domain was significantly associated with the serum ferritin level. The result showed that patients whose serum ferritin level was less than 2500 ng/ml had higher HRQOL scores than patients whose serum ferritin level was higher than 2500 ng/ml. On the other hand, no significant difference in children-rated score and parent-rated overall score and psychosocial domains was found.

Table 17 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by serum ferritin level

Scale	Serum ferritin level		
	Fe < 2500 ng/ml	Fe > 2500 ng/ml	p-value [a]
Child self-report (N=127)	(N = 79)	(N = 48)	
Total Score	76.05 ± 12.83	76.61 ± 10.14	0.897
Physical Functioning	78.20 ± 15.66	76.89 ± 13.03	0.426
Psychosocial Health	75.25 ± 13.38	75.76 ± 12.73	0.903
Parent proxy-report (N=142)	(N = 93)	(N = 49)	
Total Score	76.62 ± 14.94	73.39 ± 13.82	0.132
Physical Functioning	79.54 ± 18.36	72.64 ± 15.99	0.009*
Psychosocial Health	75.59 ± 14.87	73.80 ± 14.55	0.366

a: Mann-Whitney U Test, * Significant difference

From the scatter plot (Figure 4), no relationship between the total mean QOL score (child self-report) and serum ferritin level was found (R^2 = 0.003, p-value = 0.522). It can be explained that the effect of iron overload on QOL will be occurred in the long term in term of complication, so this cross-sectional study can not observe the effect of iron overload on patient's QOL.

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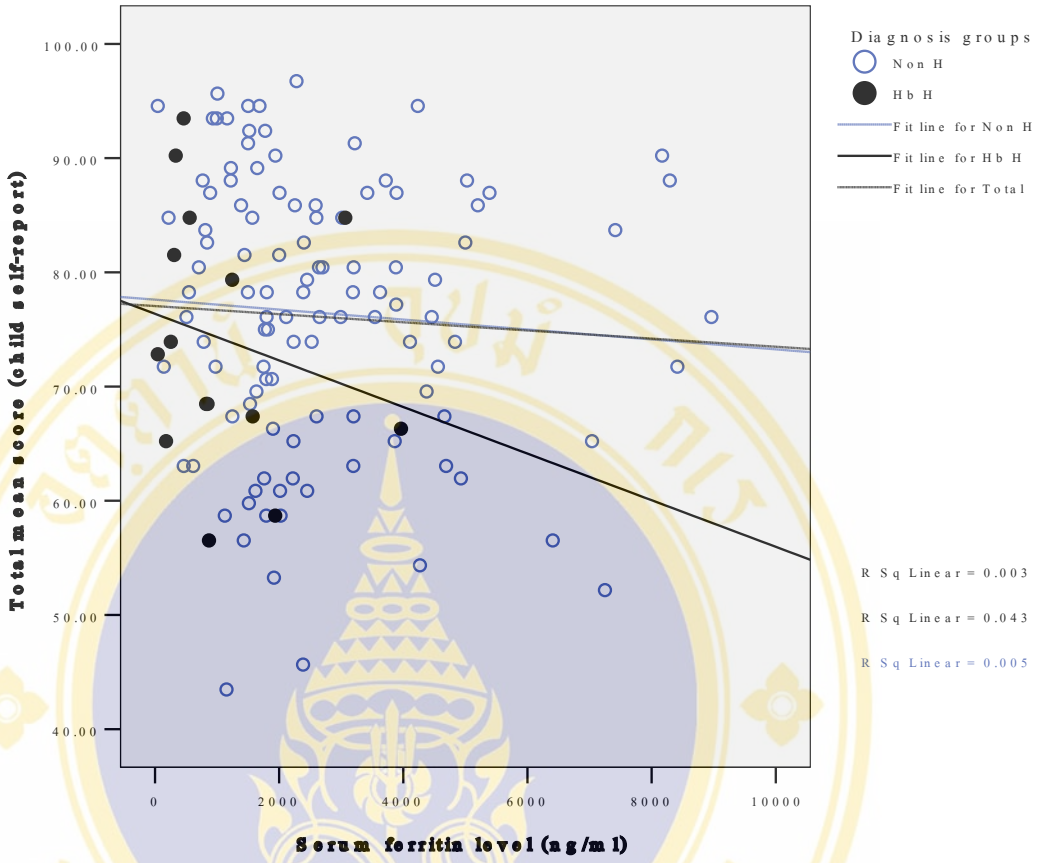

Figure 4 Scatter plot between total mean QOL score for child self-report and serum ferritin level

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8. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by diagnosis

Table 18 showed the comparison of the PedsQL 4.0 score across diagnosis for child self-report and parent proxy-report. According to Table 18, although patients who had diagnosed with homozygous beta-thalassemia seemed to have lower HRQOL scores than beta-thalassemia/Hb E and HbH patients, no significant difference in HRQOL scores was found. When classified the diagnosis as Hb H and NonH (homozygous beta-thalassemia and beta-thalassemia/Hb E), no significant difference in HRQOL scores was also found.

Table 18 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by diagnosis

Scale	Diagnosis			p-value [a]
	Beta-thalassemia/Hb E	Homozygous beta-thalassemia	Hb H	
Child self-report (N=310)	(N = 165)	(N = 15)	(N = 130)	
Total Score	76.23 ± 12.00	71.81 ± 10.83	77.54 ± 10.72	0.145
Physical Functioning	77.46 ± 15.03	73.54 ± 13.92	79.50 ± 14.62	0.187
Psychosocial Health	74.74 ± 13.20	71.89 ± 12.07	76.63 ± 12.28	0.234
Parent proxy-report (N=342)	(N = 181)	(N = 18)	(N = 143)	
Total Score	74.20 ± 14.54	73.87 ± 15.26	76.55 ± 14.43	0.270
Physical Functioning	74.79 ± 18.37	70.83 ± 21.86	77.99 ± 17.99	0.147
Psychosocial Health	74.49 ± 14.69	75.42 ± 13.63	76.29 ± 14.82	0.436

a: Kruskal-Wallis Test

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9. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by complication

Table 19 demonstrated the comparison of the PedsQL 4.0 score across complication status for child self-report and parent proxy-report. According to Table 19, no significant difference in HRQOL scores was found across complication status.

Table 19 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by complication

Scale	Complication		
	No	Yes	p-value [a]
Child self-report (N=314)	(N = 295)	(N = 19)	
Total Score	76.59 ± 11.22	77.51 ± 14.37	0.773
Physical Functioning	78.29 ± 14.51	77.14 ± 19.10	0.941
Psychosocial Health	75.34 ± 12.52	77.81 ± 16.21	0.169
Parent proxy-report (N=346)	(N = 326)	(N = 20)	
Total Score	75.14 ± 14.35	76.64 ± 16.89	0.410
Physical Functioning	76.06 ± 18.11	74.06 ± 23.12	0.986
Psychosocial Health	75.21 ± 14.47	77.98 ± 17.11	0.207

a: Mann-Whitney U Test

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10. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by type of payment

Table 20 presented the comparison of the PedsQL 4.0 score across type of payment for child self-report and parent proxy-report. According to Table 20, although it was found that patients under Universal Coverage Scheme seemed to report lower HRQOL scores than the patients who paid by themselves (out of pocket) and patients under Civil Servant Medical Benefit Scheme (CSMBS) no significant difference in HRQOL scores was found across type of payment.

Table 20 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by type of payment

Scale	Type of payment			
	Universal coverage	CSMBS	Out of pocket	p-value [a]
Child self-report (N=315)	(N = 179)	(N = 56)	(N = 80)	
Total Score	75.81 ± 12.02	78.18 ± 10.53	77.54 ± 10.48	0.298
Physical Functioning	77.69 ± 15.58	79.02 ± 14.51	78.95 ± 13.11	0.878
Psychosocial Health	74.33 ± 13.28	78.39 ± 12.36	76.23 ± 11.56	0.057
Parent proxy-report (N=347)	(N = 194)	(N = 60)	(N = 93)	
Total Score	73.89 ± 14.93	77.89 ± 13.66	76.45 ± 13.86	0.148
Physical Functioning	74.48 ± 18.95	78.75 ± 16.08	77.45 ± 18.57	0.229
Psychosocial Health	74.13 ± 15.26	78.07 ± 14.49	76.29 ± 13.07	0.155

a: Kruskal-Wallis Test

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11. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by membership of self-help group

Table 21 showed the comparison of the PedsQL 4.0 score across the membership of self-help group for child self-report and parent proxy-report. According to Table 21, no significant difference in HRQOL scores was found.

Table 21 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by membership of self-help group

Scale	Self-help group		
	Yes	No	p-value [a]
Child self-report (N=315)	(N = 32)	(N = 283)	
Total Score	77.11 ± 10.96	76.62 ± 11.47	0.785
Physical Functioning	76.56 ± 14.74	78.43 ± 14.79	0.447
Psychosocial Health	78.02 ± 10.48	75.26 ± 12.98	0.338
Parent proxy-report (N=347)	(N = 33)	(N = 314)	
Total Score	76.58 ± 13.12	75.13 ± 14.63	0.667
Physical Functioning	76.61 ± 19.07	75.96 ± 18.38	0.831
Psychosocial Health	77.12 ± 12.43	75.21 ± 14.83	0.581

a: Mann-Whitney U Test

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12. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by iron chelation therapy status

Table 22 presented the comparison of the PedsQL 4.0 score across iron chelation therapy status for child self-report and parent proxy-report. According to Table 22, no significant difference in HRQOL scores was found across iron chelation therapy status.

Table 22 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by iron chelation

Scale	Iron chelation		
	No	Yes (Desferrioxamine)	p-value [a]
Child self-report (N=314)	(N = 228)	(N = 86)	
Total Score	77.01 ± 11.10	75.68 ± 12.21	0.524
Physical Functioning	78.80 ± 14.70	76.71 ± 15.01	0.250
Psychosocial Health	75.66 ± 12.29	75.04 ± 13.97	0.942
Parent proxy-report (N=346)	(N = 255)	(N = 91)	
Total Score	75.31 ± 14.26	74.98 ± 15.18	0.931
Physical Functioning	75.71 ± 18.79	76.61 ± 17.34	0.851
Psychosocial Health	75.75 ± 14.30	74.30 ± 15.52	0.519

a: Mann-Whitney U Test

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13. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by treatment center

Table 23 presented the comparison of score of the PedsQL 4.0 across treatment center for child self-report and parent proxy-report. According to Table 23, although it was found that patients who were treated at Phramongkutklao Hospital seemed to have higher HRQOL scores than the patients who were treated at other treatment centers, no significant difference in HRQOL scores was found across treatment center.

Table 23 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by treatment center

Scale	Treatment center			
	Saraburi Hospital	King Chulalongkorn Memorial Hospital	Phramongkutklao Hospital	p-value [a]
Child self-report (N=315)	(N = 142)	(N = 111)	(N = 62)	
Total Score	75.90 ± 10.95	76.78 ± 11.46	78.24 ± 12.30	0.324
Physical Functioning	78.24 ± 15.14	77.70 ± 14.00	79.23 ± 15.42	0.714
Psychosocial Health	75.01 ± 11.88	75.27 ± 12.89	77.23 ± 14.43	0.193
Parent proxy-report (N=347)	(N = 154)	(N = 126)	(N = 67)	
Total Score	74.01 ± 14.87	75.95 ± 13.68	76.87 ± 15.01	0.304
Physical Functioning	73.97 ± 19.53	77.55 ± 17.32	77.85 ± 17.56	0.248
Psychosocial Health	74.76 ± 15.08	75.53 ± 13.54	76.58 ± 15.56	0.563

a: Kruskal-Wallis Test

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14. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by type of hospital

Table 24 showed the comparison of the PedsQL 4.0 score across the type of hospital for child self-report and parent proxy-report. According to Table 24, although it was found that patients who were treated at University Hospital seemed to have higher HRQOL scores than patients who were treated at Center Hospital, no significant difference in HRQOL scores was found.

Table 24 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by type of hospital

Scale	Type of hospital		
	Center	University	p-value [a]
Child self-report (N=315)	(N = 142)	(N = 173)	
Total Score	75.90 ± 10.95	77.31 ± 11.75	0.178
Physical Functioning	78.24 ± 15.14	78.25 ± 14.50	0.883
Psychosocial Health	75.01 ± 11.88	75.97 ± 13.45	0.234
Parent proxy-report (N=347)	(N = 154)	(N = 193)	
Total Score	74.01 ± 14.87	76.27 ± 14.13	0.161
Physical Functioning	73.97 ± 19.53	77.66 ± 17.36	0.098
Psychosocial Health	74.76 ± 15.08	75.90 ± 14.24	0.516

a: Mann-Whitney U Test

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15. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by spleen intact status status

Table 25 showed the comparison of the PedsQL 4.0 score across spleen intact status for child self-report and parent proxy-report. According to Table 25, significant differences in parent-rated HRQOL scores were found. The results revealed that the patients who had spleen intact had lower HRQOL scores than those who had no spleen intact. For children-rated HRQOL scores, no significant difference was found.

Table 25 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by spleen intact status

Scale	Spleen intact status		
	No spleen intact	Spleen intact	p-value [a]
Child self-report (N=313)	(N = 240)	(N = 73)	
Total Score	76.65 ± 11.50	76.61 ± 11.25	0.924
Physical Functioning	78.53 ± 14.92	77.27 ± 14.52	0.417
Psychosocial Health	75.87 ± 12.74	74.47 ± 12.73	0.300
Parent proxy-report (N=345)	(N = 271)	(N = 74)	
Total Score	76.23 ± 14.37	71.76 ± 14.42	0.012 *
Physical Functioning	77.51 ± 18.02	70.27 ± 18.89	0.002 *
Psychosocial Health	76.22 ± 14.52	72.55 ± 14.56	0.037 *

a: Mann-Whitney U Test, * Significant difference

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16. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by treatment status (regular and non-regular treatment)

In this study, patients who met at least one of the following criteria were classified as patients who received non-regular treatment;

1. The patients whose pre-transfusion Hb level were lower than 7 g/dL, who did not receive blood transfusion
2. The patients whose serum ferritin level were higher than 1000 ng/ml, who did not receive iron chelation therapy
3. The patients whose onset of anemia started before 2 years and the first transfusion occurred before 4 years of age, who did not receive high transfusion
4. The patients who were diagnosed with homozygous beta-thalassemia, who did not receive high transfusion

Table 26 described the comparison of score of the PedsQL 4.0 across treatment status (regular and non-regular treatment) for child self-report and parent proxy-report. According to Table 26, significant difference in children-rated HRQOL total score was found. The finding revealed that the patients who received regular treatment had higher HRQOL scores than those of non-regular treatment.

Table 26 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by treatment status

Scale	Type of treatment		
	Non-regular treatment	Regular treatment	p-value [a]
Child self-report (N=315)	(N = 77)	(N = 238)	
Total Score	73.96 ± 11.30	77.55 ± 11.31	0.019 *
Physical Functioning	75.89 ± 15.63	79.00 ± 14.43	0.154
Psychosocial Health	74.49 ± 11.95	75.88 ± 13.01	0.221
Parent proxy-report (N=347)	(N = 93)	(N = 254)	
Total Score	75.08 ± 13.45	75.33 ± 14.87	0.680
Physical Functioning	76.92 ± 17.91	75.69 ± 18.62	0.660
Psychosocial Health	75.48 ± 13.87	75.36 ± 14.90	0.863

a: Mann-Whitney U Test, * Significant difference

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17. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by hemoglobin level measured during the past 3 months before assessing the quality of life

Table 27 showed the comparison of the PedsQL 4.0 score across pre-transfusion Hb level measured during the past 3 months before assessing the quality of life for child self-report and parent proxy-report. According to Table 27, significant differences in total score and psychosocial domains of children-rated and all domains of parent-rated HRQOL scores were found. The finding revealed that HRQOL scores were significantly associated with degree of anemia. It was found that the patients who had higher Hb level also had significantly higher HRQOL scores than the patients who had lower Hb level.

Table 27 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by hemoglobin level before evaluating quality of life data 3 months

Scale	Hemoglobin level in the past 3 months before assessing the quality of life			
	Hb < 7 g/dL	Hb 7-9 g/dL	Hb > 9 g/dL	p-value [a]
Child self-report (N=265)	(N = 49)	(N = 159)	(N = 57)	
Total Score	73.51 ± 13.07	75.59 ± 11.09	79.82 ± 10.22	0.012 *
Physical Functioning	75.06 ± 17.84	77.10 ± 14.61	81.03 ± 13.35	0.163
Psychosocial Health	73.83 ± 13.42	73.78 ± 13.21	79.18 ± 11.33	0.016 *
Parent proxy-report (N=295)	(N = 55)	(N = 175)	(N = 65)	
Total Score	72.91 ± 15.74	73.11 ± 14.86	80.39 ± 12.11	0.002 *
Physical Functioning	72.39 ± 21.47	73.64 ± 18.15	81.15 ± 16.52	0.011 *
Psychosocial Health	73.79 ± 15.63	73.47 ± 15.52	80.26 ± 11.62	0.009 *

a: Kruskal-Wallis Test, * Significant difference

From the scatter plot (Figure 5), positive relationship between the total mean QOL score (child self-report) and pre-transfusion Hb level during the past 3 months before assessing the quality of life for total patients was found ($R^2 = 0.027$, p-value = 0.006).

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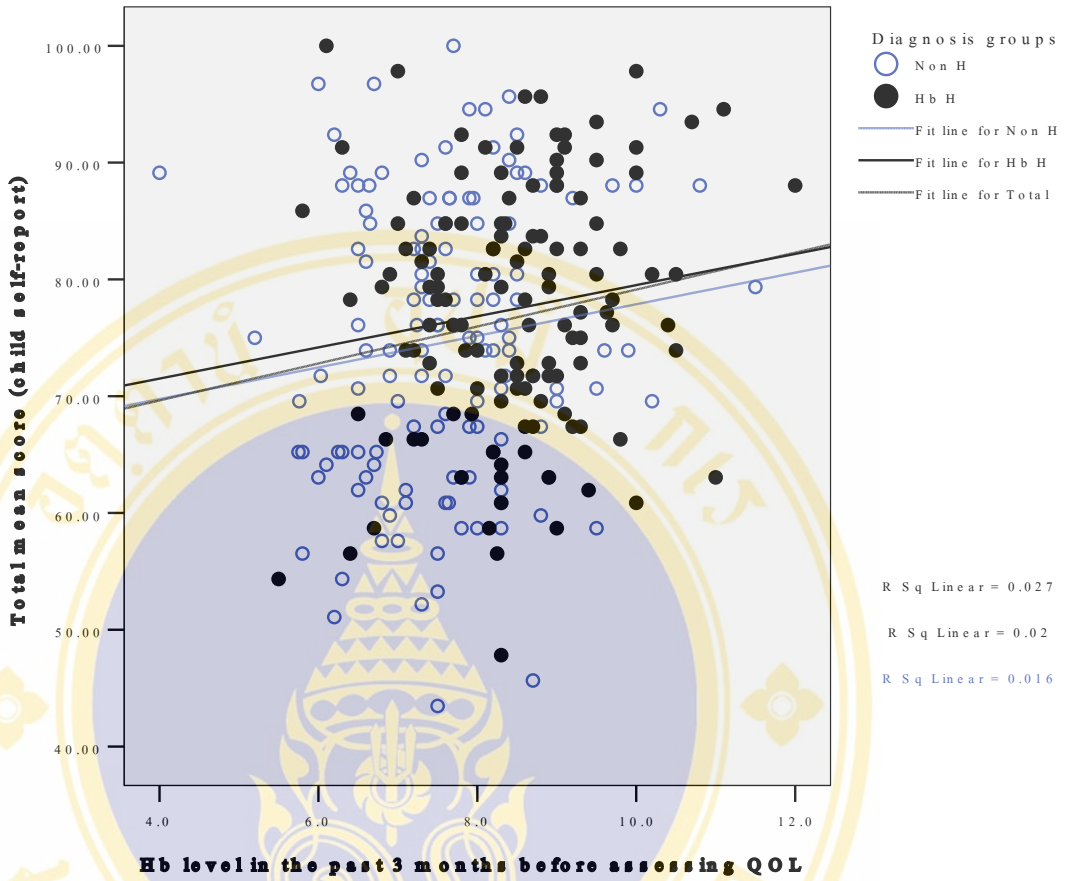

Figure 5 Scatter plot between total mean QOL score for child self-report and pre-transfusion Hb level during the past 3 months before assessing the quality of life

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18. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by gender

Table 28 presented the comparison of the PedsQL 4.0 score across gender for child self-report and parent proxy-report. According to Table 28, no significant difference in HRQOL scores was found across gender.

Table 28 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by gender

Scale	Gender		
	Male	Female	p-value [a]
Child self-report (N=314)	(N = 159)	(N = 155)	
Total Score	76.87 ± 11.31	76.42 ± 11.54	0.701
Physical Functioning	78.79 ± 14.77	77.64 ± 14.83	0.460
Psychosocial Health	75.86 ± 11.15	75.11 ± 14.24	0.760
Parent proxy-report (N=346)	(N = 175)	(N = 171)	
Total Score	75.26 ± 13.14	75.19 ± 15.78	0.572
Physical Functioning	76.34 ± 17.79	75.55 ± 19.05	0.829
Psychosocial Health	75.30 ± 13.00	75.44 ± 16.15	0.408

a: Mann-Whitney U Test

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19. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by severity of disease

Table 29 showed the comparison of score of the PedsQL 4.0 across severity of disease for child self-report and parent proxy-report. According to Table 29, significant differences in children-rated HRQOL scores of total and physical domains were found. It was found that severe thalassemia patients were more likely to have significantly lower HRQOL scores than non-severe patients. Moreover, it was also found that scores on psychosocial domain of children-rated and overall domains of parent-rated HRQOL seemed to be higher in non-severe thalassemia patients than severe thalassemia patients.

Table 29 PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by group of severity of disease

Scale	Group of severity of disease		
	Non-severe	Severe [b]	p-value [a]
Child self-report (N=315)	(N = 209)	(N = 106)	
Total Score	78.27 ± 10.89	73.53 ± 11.78	0.001 *
Physical Functioning	80.26 ± 13.90	74.26 ± 15.67	0.001 *
Psychosocial Health	75.95 ± 13.12	74.72 ± 12.04	0.243
Parent proxy-report (N=347)	(N = 225)	(N = 122)	
Total Score	76.06 ± 14.22	73.81 ± 14.91	0.189
Physical Functioning	77.26 ± 17.21	73.72 ± 20.33	0.206
Psychosocial Health	75.67 ± 14.53	74.89 ± 14.80	0.679

a: Mann-Whitney U Test, * Significant difference

b: Severe thalassemia patients were defined as patients whose onset of anemia were before 2 years of age and the first transfusion occurred before 4 years of age or patients who were diagnosed with Homozygous beta-thalassemia or patients whose pre-transfusion Hb level were lower than 7 g/dL.

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20. PedsQL 4.0 Generic Core Scale for child self-report and parent proxy-report by severity of disease and treatment center

Table 30 described the comparison of the PedsQL 4.0 score for child self-report across severity of disease and treatment center. According to Table 30, no significant difference HRQOL score was found.

In severe thalassemia patients group, it was found that overall HRQOL scores of the patients who were treated at Phramongkutklao Hospital were higher than the patients who treated at King Chulalongkorn Memorial Hospital and Saraburi Hospital, respectively. However, the significant difference was not found.

For non-severe thalassemia patients group, the finding revealed that the overall HRQOL scores of patients who treated at Phramongkutklao Hospital were higher than those of the patients who treated at King Chulalongkorn Memorial Hospital and Saraburi Hospital, respectively. However, the significant difference was not found.

Similar to child self-report, it was found that parent-rated HRQOL scores of non-severe thalassemia patients were higher than those of severe thalassemia patients. In addition, overall HRQOL scores of the patients who were treated at Phramongkutklao Hospital seemed to be higher than those of the patients, who were treated at King Chulalongkorn Memorial Hospital and Saraburi Hospital, respectively. However, no significant difference was found. The comparison between the PedsQL 4.0 for parent proxy-report classified by the severity of disease and treatment center was described in Table 31.

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Table 30 PedsQL 4.0 Generic Core Scale for child self-report by severity of disease and treatment center

Group of severity of disease and treatment center	Child self-report			
	N	Total Score	Physical Functioning	Psychosocial Health
Severe group [b] (N=106)				
Saraburi Hospital	48	72.10 ± 11.72	72.59 ± 17.16	73.87 ± 11.59
King Chulalongkorn Memorial Hospital	43	73.81 ± 11.99	74.78 ± 14.55	74.30 ± 11.25
Phramongkutklao Hospital	15	77.32 ± 11.21	78.13 ± 13.88	78.67 ± 15.38
p-value [a]		0.302	0.530	0.149
Non-severe group (N=209)				
Saraburi Hospital	94	77.84 ± 10.04	81.12 ± 13.19	75.59 ± 12.05
King Chulalongkorn Memorial Hospital	68	78.66 ± 10.77	79.55 ± 13.43	75.88 ± 13.87
Phramongkutklao Hospital	47	78.54 ± 12.73	79.59 ± 16.01	76.77 ± 14.25
p-value [a]		0.699	0.806	0.621

a: Kruskal-Wallis Test

b: Severe thalassemia patients were defined as patients whose onset of anemia were before 2 years and the first transfusion occurred before 4 years of age or patients who were diagnosed with Homozygous beta-thalassemia or patients whose pre-transfusion Hb level were lower than 7 g/dL.

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Table 31 PedsQL 4.0 Generic Core Scale for parent proxy-report by severity of disease and treatment center

Group of severity of disease and treatment center	Parent proxy-report			
	N	Total score	Physical Functioning	Psychosocial Health
Severe group [b] (N=122)				
Saraburi Hospital	57	71.60 ± 15.97	70.50 ± 23.37	73.80 ± 15.75
King Chulalongkorn Memorial Hospital	48	75.27 ± 13.86	76.82 ± 18.34	74.79 ± 13.25
Phramongkutklao Hospital	17	77.09 ± 13.75	75.74 ± 12.43	78.84 ± 15.89
p-value [a]		0.438	0.464	0.311
Non-severe group (N=225)				
Saraburi Hospital	97	75.42 ± 14.08	76.00 ±16.67	75.33 ± 14.72
King Chulalongkorn Memorial Hospital	78	76.38 ± 13.65	78.00 ± 16.77	75.99 ± 13.78
Phramongkutklao Hospital	50	76.79 ± 15.55	78.56 ± 19.05	75.81 ± 15.54

a: Kruskal-Wallis Test

b: Severe thalassemia patients were defined as patients whose onset of anemia were before 2 years and the first transfusion occurred before 4 years of age or patients who were diagnosed with Homozygous beta-thalassemia or patients whose pre-transfusion Hb level were lower than 7 g/dL.

The summary of P-Value from the univariate analysis for total patients, Hb H patients and Non H patients was reported, as shown in Table 32, 33 and 34, respectively. According to Table 32, the findings revealed that factors related to the total HRQOL score for child-rated report were age, pre-transfusion Hb level, onset of anemia, type of treatment and severity of disease.

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Table 32 Summary of the P-Value for all patients

Characteristics	P-value					
	Overall domains		Physical domain		Psychosocial domain	
	Child-self report	Parent-proxy report	Child-self report	Parent-proxy report	Child-self report	Parent-proxy report
1. Age (year)	0.001*	0.008*	0.054*	0.001*	0.003*	<0.001*
2. Pre-transfusion Hb level (g/dL)	0.042*	0.004*	0.054*	0.016*	0.028*	0.006*
3. Hematocrit level (%)	0.078	<0.001*	0.203	0.002*	0.002*	0.001*
4. Type of blood transfusion	0.420	0.163	0.620	0.133	0.449	0.398
5. Age onset of anemia (year)	0.043*	0.501	0.040*	0.721	0.071	0.574
6. Age at first transfusion (year)	0.128	0.456	0.125	0.803	0.712	0.128
7. Serum ferritin level (ng/ml)	0.897	0.132	0.426	0.009*	0.903	0.366
8. Diagnosis	0.145	0.270	0.187	0.147	0.234	0.436
9. Complications	0.773	0.410	0.941	0.986	0.169	0.207
10. Type of payment	0.298	0.148	0.878	0.229	0.057	0.155
11. Membership of self-help group	0.785	0.667	0.447	0.831	0.338	0.581
12. Iron chelation therapy status	0.524	0.931	0.250	0.851	0.942	0.519
13. Treatment center	0.324	0.304	0.714	0.248	0.193	0.563
14. Type of hospital	0.178	0.161	0.883	0.098	0.234	0.516
15. Spleen intact status	0.924	0.012*	0.417	0.002*	0.300	0.037*
16. Treatment status (regular VS non-regular treatment)	0.019*	0.680	0.154	0.660	0.221	0.863
17. Pre-transfusion Hb level in the past 3 months before assessing QOL	0.012*	0.002*	0.163	0.011*	0.016*	0.009*
18. Gender	0.701	0.572	0.460	0.829	0.760	0.408
19. Severity of disease (severe VS non-severe)	0.001*	0.189	0.001*	0.206	0.243	0.679

*Significant difference, p-value < 0.05

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Table 33 Summary of the P-Value for Hb H patients

Characteristics	P-value					
	Overall domains		Physical domain		Psychosocial domain	
	Child-self report	Parent-proxy report	Child-self report	Parent-proxy report	Child-self report	Parent-proxy report
1. Age (year)	0.001*	0.354	0.125	0.235	0.047*	0.182
2. Pre-transfusion Hb level (g/dL)	0.411	0.025*	0.182	0.086	0.156	0.033*
3. Hematocrit level (%)	0.221	0.011*	0.754	0.088	0.033*	0.010*
4. Type of blood transfusion	0.712	0.141	0.586	0.099	0.341	0.393
5. Age onset of anemia (year)	0.932	0.807	0.819	0.641	0.384	0.822
6. Age at first transfusion (year)	0.633	0.213	0.959	0.413	0.677	0.089
7. Serum ferritin level (ng/ml)	0.856	0.556	0.298	0.887	0.386	0.418
8. Complications	0.591	0.859	0.615	0.504	0.463	0.784
9. Type of payment	0.998	0.151	0.907	0.684	0.335	0.101
10. Membership of self-help group	0.510	0.685	0.785	0.593	0.575	0.382
11. Iron chelation therapy status	0.215	0.268	0.969	0.319	0.134	0.286
12. Treatment center	0.726	0.721	0.644	0.900	0.756	0.637
13. Type of hospital	0.510	0.751	0.605	0.990	0.457	0.516
14. Spleen intact status	0.702	0.036*	0.498	0.037*	0.422	0.055
15. Treatment status (regular VS non-regular treatment)	0.006*	0.471	0.108	0.579	0.418	0.799
16. Pre-transfusion Hb level in the past 3 months before assessing QOL	0.366	0.066	0.779	0.318	0.138	0.044
17. Gender	0.147	0.347	0.277	0.325	0.081	0.435
18. Severity of disease (severe VS non-severe)	0.161	0.184	0.208	0.076	0.874	0.998

* Significant difference, p-value < 0.05

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Table 34 Summary of the P-Value for Non H patients

Characteristics	P-value					
	Overall domains		Physical domain		Psychosocial domain	
	Child-self report	Parent-proxy report	Child-self report	Parent-proxy report	Child-self report	Parent-proxy report
1. Age (year)	0.075	0.003*	0.171	0.002*	0.018*	<0.001*
2. Pre-transfusion Hb level (g/dL)	0.199	0.195	0.571	0.411	0.198	0.085
3. Hematocrit level (%)	0.013*	0.067	0.049*	0.060	0.109	0.254
4. Type of blood transfusion	0.615	0.633	0.801	0.628	0.762	0.632
5. Age onset of anemia (year)	0.004*	0.548	0.005*	0.745	0.102	0.623
6. Age at first transfusion (year)	0.215	0.980	0.036*	0.578	0.995	0.832
7. Serum ferritin level (ng/ml)	0.955	0.133	0.390	0.006*	0.824	0.429
8. Diagnosis	0.171	0.928	0.332	0.393	0.422	0.797
9. Complications	0.505	0.582	0.950	0.393	0.126	0.199
10. Type of payment	0.176	0.623	0.469	0.269	0.330	0.855
11. Membership of self-help group	0.886	0.407	0.432	0.371	0.171	0.481
12. Iron chelation therapy status	0.973	0.356	0.669	0.095	0.416	0.974
13. Treatment center	0.480	0.018*	0.756	0.038*	0.072	0.079
14. Type of hospital	0.292	0.012*	0.496	0.007*	0.094	0.088
15. Spleen intact status	0.894	0.197	0.957	0.042*	0.942	0.349
16. Treatment status (regular VS non-regular treatment)	0.885	0.655	0.709	0.325	0.844	0.998
17. Pre-transfusion Hb level in the past 3 months before assessing QOL	0.248	0.818	0.494	0.693	0.818	0.753
18. Gender	0.547	0.502	0.898	0.770	0.459	0.477
19. Severity of disease (severe VS non-severe)	0.005	0.962	0.006*	0.652	0.487	0.895

* Significant difference, p-value < 0.05

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Multiple regression analysis in factors affecting the health-related quality of life of thalassemia patients

From the assumption of multiple linear regression analysis, the dependent variable must be normally distributed and independent variables included in the model should not be related to one another. In addition, when linear regression is being used, the relationship of the independent variables and dependent variable assumed to be linear.

In this study, total mean QOL score for child self-report was the dependent variable since it was expected to better reflect patient perception, as compare to parent report. In the first step of analysis, all variables that were expected to relate to the total mean QOL score of child self-report in univariate analysis were screened to be included in the model. These factors were age, onset of anemia, diagnosis groups (Hb H or Non H), the mean pre-transfusion Hb level during the past one year, the mean pre-transfusion Hb level during the past 3 months before assessing QOL, treatment status (regular or non-regular treatment), type of hospital (university or center hospital) and severity of disease (severe or non-severe). From the assumption of multiple regression, the independent variables must not correlate with each other. Since Hb level during the past one year were less likely to be a predictor of HRQOL, as compared to the mean Hb level during the past 3 months before assessing QOL then Hb level during the past one year was not included in the model. According to the criteria used to classify severity of patients as described earlier in this study, severity might correlate with the Hb level and onset of anemia then we did not include this factor in the model. Finally, the six selected factors (from 8 factors) in the multiple regression model were age, onset of anemia, diagnosis groups (Hb H or Non H), the mean pre-transfusion Hb level during the past 3 months before assessing QOL, treatment status and type of hospital. These variables were analyzed using the Stepwise method (criteria: probability of F statistics < 0.05).

For this analysis, it was found that diagnosis groups, onset of anemia, and type of hospital were not related to the HRQOL of thalassemia patients. On the other hand, patient's HRQOL was affected by three predictor variables (age, the mean pre-transfusion Hb level during the past 3 months before assessing QOL and regular treatment status), which accounted for 12.6% of the variance in HRQOL. Age, the

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mean pre-transfusion Hb level and regular treatment status were positively related to positive total mean score of the QOL. It could be explained that if the age of thalassemia patients increased 1 year, their HRQOL scores would increase 0.947 point (P < 0.001), while holding other variables constant. As for the mean pre-transfusion Hb level during the past 3 months before assessing HRQOL, while holding other variables constant, if pre-transfusion Hb level increase 1 g/dL, their HRQOL scores would increase 1.670 point (P = 0.004). If the thalassemia patient received regular treatment status, while holding other variables constant, their HRQOL scores would increase 3.459 score (P = 0.031), as shown in Table 35.

Table 35 Coefficients of selected variables in multiple regression for the health-related quality of life of children with thalassemia

Variables	Unstandardized Coefficients		Standardized Coefficients	t	P-Value
	β	Std. Error	β		
Constant	50.838	5.100		9.969	.000
Age (year)	.947	.204	.283	4.647	.000
Pre-transfusion Hb level during the past 3 months before assessing QOL	1.670	.579	.179	2.884	.004
Regular treatment	3.459	1.596	.134	2.167	.031

a. Dependent variable: Total mean score (child self-report)

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Part 3: Expectation and satisfaction

Expectation and satisfaction

Table 36 depicted the expectation on healthcare service that was responded by parents of the thalassemia patients. It was found that most of them had high expectation in all aspects (tangibles, reliability, responsiveness, assurance, and empathy) of service quality. The highest percentages of the parents (98.6%) expected that the health facilities must posses all types of medicine and medical supplies with sufficient amount. The next two high percentages of expectation stated by the parents were that the correct and suitable treatment should be provided (98.3%) and that doctors, nurses, and other officers must have good skill (97.5%), respectively. On the contrary, the expectation about the rapid of service was in the lowest percentages (75.4%).

Table 36 Expectation of patients and their parents on healthcare service

Expectation (N=362)	Number of respondent (%)	
	Unexpected	Expected
1. Having sufficient specialist physician	35 (9.7)	327 (90.3)
2. Having all types of medical equipments	13 (3.6)	349 (96.4)
3. Having all kinds of medicine and medical supplies with sufficient amount	5 (1.4)	357 (98.6)
4. Doctors, nurses, and other officers have good skill	9 (2.5)	353 (97.5)
5. The hospital provides good service care	10 (2.8)	352 (97.2)
6. This hospital provides the best treatment in regardless of socioeconomic status and type of payment	32 (8.8)	330 (91.2)
7. Provide service rapidly	89 (24.6)	273 (75.4)
8. In the case of emergency illness, you can receive treatment quickly.	50 (13.8)	312 (86.2)
9. The process of service provided at this hospital is easy to understand without confusing	52 (14.4)	310 (85.6)
10. Doctors, nurses and other officers provide clear information and good suggestion	10 (2.8)	352 (97.2)
11. Doctors, nurses and other officers are interested in your symptom	17 (4.7)	345 (95.3)

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Table 36 Expectation of patients and their parents on healthcare service (continued)

Expectation (N=362)	Number of respondent (%)	
	Unexpected	Expected
12. Doctors, nurses and other officers spend more time for examining and suggestion	17 (4.7)	345 (95.3)
13. Doctors, nurses and other officers provide prompt service	18 (5.0)	344 (95.0)
14. This hospital provides correct and suitable treatment	6 (1.7)	356 (98.3)
15. Doctors, nurses and other officers provide care with empathy	15 (4.1)	347 (95.9)
16. Doctors, nurses and other officers are nice and friendly	27 (7.5)	335 (92.5)
17. Doctors, nurses and other officers are interested in your problem	16 (4.4)	346 (95.6)
18. Doctors, nurses and other officers help solving your problem and providing alternative choice	23 (6.4)	339 (93.6)

Table 37 presented satisfaction of the healthcare service received in each item. Considering each item, most of them (93.4%) were satisfied that doctors, nurses and other officers were interested in their children's symptom. The next two highest satisfactions were that doctors, nurses and other officers provided clear information and good suggestion (91.7%), doctors, nurses and other officers provided care with empathy (91.4%) and doctors, nurses and other officers had good skill (91.4%), respectively. However, about 16% and 11% of the respondents were not satisfied with the speed of services provided by doctors, nurses, and any officers and the sufficiency amount of specialist physicians, respectively. The overall results of this research indicated that the parents had high level of satisfaction with the healthcare service.

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Table 37 Satisfaction of patients and their parents on healthcare service

Satisfaction (N=362)	Number of respondent (%)		
	Poor	Not sure	Good
1. Having sufficient specialist physician	41 (11.3)	47 (13.0)	274 (75.7)
2. Having all types of medical equipments	10 (2.8)	54 (14.9)	298 (82.3)
3. Having all kinds of medicine and medical supplies with sufficient amount	6 (1.7)	28 (7.7)	328 (90.6)
4. Doctors, nurses, and other officers have good skill	5 (1.4)	26 (7.2)	331 (91.4)
5. The hospital provides good service care	1 (0.3)	34 (9.4)	327 (90.3)
6. This hospital provides the best treatment in regardless of seriocomic status and type of payment	6 (1.7)	61 (16.9)	295 (81.5)
7. Provide service rapidly	57 (15.7)	97 (26.8)	208 (57.5)
8. In the case of emergency illness, you can receive treatment quickly.	27 (7.5)	78 (21.5)	257 (71.0)
9. The process of service provided at this hospital is easy to understand without confusing	23 (6.4)	50 (13.8)	289 (79.8)
10. Doctors, nurses and other officers provide clear information and good suggestion	7 (1.9)	23 (6.4)	332 (91.7)
11. Doctors, nurses and other officers are interested in your symptom	6 (1.7)	18 (5.0)	338 (93.4)
12. Doctors, nurses and other officers spend more time for examining and suggestion	9 (2.5)	34 (9.4)	319 (88.1)
13. Doctors, nurses and other officers provide prompt service	6 (1.7)	54 (14.9)	302 (83.4)
14. This hospital provides correct and suitable treatment	3 (0.8)	39 (10.8)	320 (88.4)
15. Doctors, nurses and other officers provide care with empathy	4 (1.1)	27 (7.5)	331 (91.4)
16. Doctors, nurses and other officers are nice and friendly	4 (1.1)	47 (13.0)	311 (85.9)
17. Doctors, nurses and other officers are interested in your problem	3 (0.8)	37 (10.2)	322 (89.0)
18. Doctors, nurses and other officers help solving your problem and providing alternative choice	7 (1.9)	50 (13.8)	305 (84.3)

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According to Table 38, the study revealed that most of the respondents (68.8%) indicated that they had high satisfaction with health care service received. Almost 22% of the respondents had the highest satisfaction level. Only one patient (0.3%) indicated having the lowest satisfaction level on health care service received.

Table 38 Overall satisfaction of patients and their parents on healthcare service

Satisfaction level (N=362)	Number of respondent (%)
Lowest satisfaction	1 (0.3)
Low satisfaction	10 (2.8)
Moderate satisfaction	25 (6.9)
High satisfaction	249 (68.8)
Highest satisfaction	77 (21.3)

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Univariate analysis in the satisfaction

1. Overall satisfaction of the patients on healthcare service by type of payment

From the data obtained, it was found that there was no significant difference among those who were under universal coverage (UC), Civil Servant Medical Benefit Scheme (CSMBS), and out of pocket (OOP) in their overall satisfaction, as presented in Table 39.

Table 39 Overall satisfaction of the patients on healthcare service by type of payment

Type of payment / Satisfaction level	Number of respondent (%)			p-value [a]
	UC (N=206)	CSMBS (N=61)	OOP (N=95)	
Lowest satisfaction	0 (0)	0 (0)	1 (1.1)	
Low satisfaction	5 (2.4)	2 (3.3)	3 (3.2)	
Moderate satisfaction	14 (6.8)	2 (3.3)	9 (9.5)	0.266
High satisfaction	135 (65.5)	45 (73.8)	69 (72.6)	
Highest satisfaction	52 (25.2)	12 (19.7)	13 (13.7)	

Values are presented as frequency (percentage), a: Chi-square

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2. Overall satisfaction of the patients on healthcare service by treatment center

As shown in Table 40, it was found that there was no significant difference among those who were recruited from Saraburi Hospital, King Chulalongkorn Memorial Hospital, and Phramongkutklao Hospital in their overall satisfaction.

Table 40 Overall and satisfaction of the patients healthcare service by treatment center

Treatment center / Satisfaction level	Number of respondent (%)			p-value [a]
	Saraburi Hospital (N=154)	King Chulalongkorn Memorial Hospital (N=126)	Phramongkutklao Hospital (N=78)	
Lowest satisfaction	0 (0)	1 (0.8)	0 (0)	
Low satisfaction	5 (3.2)	5 (4)	0 (0)	
Moderate satisfaction	9 (5.8)	11 (8.7)	4 (5.1)	0.337
High satisfaction	103 (66.9)	89 (70.6)	54 (69.2)	
Highest satisfaction	37 (24)	20 (15.9)	20 (25.6)	

Values are presented as frequency (percentage), a: Chi-square

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3. Overall satisfaction on healthcare service classified by treatment center and type of payment

Table 41 described overall satisfaction of patients on healthcare service classified by treatment center and type of payment. According to Table 41, no significant difference in total satisfaction was found in patients who were recruited from Saraburi Hospital and King Chulalongkorn Memorial Hospital. On the contrary, it was found that satisfaction of patients who were recruited from Phramongkutklao Hospital were significantly associated with type of payment. The finding revealed that the patients who were under universal coverage (UC) were less likely to report high satisfaction level, as compared to those under the CSMBS and out of pocket (OOP).

Table 41 Overall satisfaction of patients on healthcare service classified by treatment center and type of payment

Hospital	Satisfaction level	Number of respondent (%)			p-value [a]
		UC	CSMBS	OOP	
Saraburi Hospital (N = 156)	Lowest satisfaction	-	-	-	0.190
	Low satisfaction	4 (3.0)	1 (7.1)	0 (0)	
	Moderate satisfaction	5 (3.8)	2 (14.3)	2 (22.2)	
	High satisfaction	91 (68.4)	9 (64.3)	5 (55.6)	
	Highest satisfaction	33 (24.8)	2 (14.3)	2 (22.2)	
King Chulalongkorn Memorial Hospital (N = 126)	Lowest satisfaction	0 (0)	0 (0)	1 (1.5)	0.752
	Low satisfaction	1 (2.6)	1 (4.5)	3 (4.5)	
	Moderate satisfaction	4 (10.5)	0 (0)	7 (10.6)	
	High satisfaction	25 (65.8)	17 (71.2)	47 (71.2)	
	Highest satisfaction	8 (21.1)	4 (18.2)	8 (12.1)	
Phramongkutklao Hospital (N = 80)	Lowest satisfaction	-	-	-	0.043*
	Low satisfaction	-	-	-	
	Moderate satisfaction	5 (14.3)	0 (0)	0 (0)	
	High satisfaction	19 (54.3)	19 (76.0)	17 (85.0)	
	Highest satisfaction	11 (31.4)	6 (24.0)	3 (15.0)	

a: Chi-square, * Significant difference

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4. Overall satisfaction on healthcare service classified by severity of disease

Table 42 presented overall satisfaction of patients on healthcare service classified by severity of disease. According to Table 42, it was found that there was no significant difference between those who were severe and non-severe in their total satisfaction.

Table 42 Overall satisfaction of patients on healthcare service classified by severity of disease

Severity of disease / Satisfaction level	Number of respondent (%)		P-value [a]
	Severe (N=124)	Non-severe (N=234)	
Lowest satisfaction	0 (0)	1 (0.4)	
Low satisfaction	3 (2.4)	7 (3)	
Moderate satisfaction	9 (7.3)	15 (6.4)	0.317
High satisfaction	78 (62.9)	168 (71.8)	
Highest satisfaction	34 (27.4)	43 (18.4)	

Values are presented as frequency (percentage), a: Chi-square

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5. Overall satisfaction on healthcare service classified by treatment status

Table 43 presented overall satisfaction of patients on healthcare service classified by treatment status. According to Table 43, it was found that there was significant difference between those who were received regular and non-regular treatment in their total satisfaction.

Table 43 Overall satisfaction of patients on healthcare service classified by treatment status

Type of treatment / Satisfaction level	Number of respondent (%)		P-value [a]
	Non-regular treatment (N=95)	Regular treatment (N=263)	
Lowest satisfaction	0 (0)	1 (0.4)	
Low satisfaction	2 (2.1)	8 (3)	
Moderate satisfaction	10 (10.5)	14 (5.3)	0.027*
High satisfaction	54 (56.8)	192 (73)	
Highest satisfaction	29 (30.5)	48 (18.3)	

Values are presented as frequency (percentage), a: Chi-square, * Significant difference

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CHAPTER V
DISCUSSION

This research study focuses on the health-related quality of life of children with thalassemia, a chronic disease with high prevalence in the world of which the majority of the patients were living in South East Asia (1, 2). In Thailand, the health-related quality of life (HRQOL) of children with thalassemia has not been evaluated. This study discusses on many related issues as followings;

Part 1: The PedsQL 4.0 generic core scale

Part 2: Health-related quality of life

Part 3: The affected quality of life domains of children with thalassemia

Part 4: Factors affecting the quality of life of children with thalassemia

Part 5: Determination of the factors affecting the health-related quality of life of children with thalassemia using multiple regression analysis

Part 6: Limitation of the study

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The PedsQL 4.0 generic core scale

The health-related quality of life of children with thalassemia was assessed using Thai version of the PedsQL 4.0 generic core scale. These analyses found that the Thai PedsQL 4.0 had reliability and validity both child self-report and parent proxy-report for evaluating the health-related quality of life in thalassemia patients. Items on the PedsQL 4.0 had minimal missing responses (0.32% due to stopped study then no response in the part of school functioning), suggesting that children and parents are willing and able to provide good quality data regarding the child's HRQOL. For reliability test, the PedsQL 4.0 self report and proxy-report internal consistency reliabilities generally exceeded the recommended minimum alpha coefficient standard of 0.70. This study found that the cronbach's alpha of 0.819 and 0.886 for total score of child self-report and parent proxy-report, respectively. In addition, the score of PedsQL 4.0 generic core scale was found to be significantly related to several important clinical factors such as pre-transfusion Hb level, severity, and treatment status.

Health-related quality of life

The parent proxy-report HRQOL scores were found to be significantly lower than those of their children-reported. Similar to the other studies (3-8), parent-rated HRQOL scores were significantly lower than those of their children-rated. It is likely that parents are worry about illness and future health of their children including cost of treatment.

Comparison to Malaysian children with Thalassemia

A recent study (9) of the quality of life of children with thalassemia in Malaysia using the PedsQL 4.0 generic scale score was conducted. The comparison between children with thalassemia and healthy controls in this study demonstrated that children with thalassemia reported not only lower physical functioning score but also showed lower score on social, and school functioning in comparison to healthy children. Especially school functioning, the findings found that thalassemia children had lower HRQOL score than healthy children. This seemed to prove that thalassemia children had to attend the hospital for follow-up or blood transfusion so they were

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more likely to absent from school hence lead to poor HRQOL especially in school domain.

When compared with Thai children with thalassemia, the findings revealed that Thai children with thalassemia had HRQOL scores higher than Malaysian children with thalassemia. One reason might be due to the fact that more than half (59%) of the sample in the study of Ismail et al. were beta thalassemia major while a majority (53.2%) of Thai children with thalassemia in this study were beta-thalassemia/Hb E. In addition, the mean serum ferritin level of sample in Ismail's study is 4739.45 ng/ml whereas the mean serum ferritin level of sample in our study is 2373.16 ng/ml. It exhibited that Malaysian children with thalassemia in that study had more severe symptom than Thai children with thalassemia in this study. Furthermore, it might be due to the difference cultures and environment between Thailand and Malaysia. In Thai family, we observed that parents are over-protective and well look after their children. This reason may be contribute to higher score in psychosocial domain of Thai children with thalassemia, as compared to that of Malaysian children with thalassemia.

Comparison to Thai children with ADHD

The PedsQL 4.0 generic core scale was previously used to measure HRQOL of Thai children with ADHD at the age of 8-12 years old (7). When compared with thalassemia children at the same age range, it was found that thalassemia children were higher HRQOL scores than children with ADHD. Consistent with the study by Sawyer MG et al (6), children with mental disorder including ADHD reported lower QOL than children with physical disorders. It is also possible that severe thalassemia patients might have died since they were very young so the patients at this age group consisted mainly of those who had mild or modereate anemia.

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The affected quality of life domains of the children with Thalassemia

The PedsQL 4.0 generic core scale covers 4 domains including physical, emotional, social and school functioning. The findings showed that school and emotional domains were the most affected domains among these thalassemia patient. It can be explained as the following:

School functioning domain seemed to get the highest impact among the thalassemia patients. The mean score for school functioning in this study was 67.89 with the SD of 15.92, which were the lowest, as compared to other domains. Congruent with the previous study (10), it was found that adverse impact of thalassemia was perceived in the domain of education. It could be the result that thalassemia children had to frequently attend the hospital for follow-up treatment, which sometimes took a whole day so they missed school quite often, hence, led to poor HRQOL in school domain.

Also, thalassemia patients in this study showed some impairment in emotional functioning as indicated by the mean of emotional functioning score of 75.90 with the SD of 16.62. Similar to the previous studies (9, 11), it was reported that emotional functioning was one of the impaired domains of thalassemia patients. Therefore, parent should take some efforts to provide emotional support and encouragement, and to improve Emotional Intelligence Quotient (EQ) of their children to be able to assess, and manage the emotions of one's self, of others, and of groups. The following, intervention were suggested.

For school

1. To assist children with thalassemia in school, the teacher should know and understand about thalassemia disease including the limitation of these patients.

2. To improve knowledge and understanding about thalssemia, health education about thalassemia should be taught in school.

For provider

1. As indicated that regular treatment would increase HRQOL of the patients, then regular treatment should be offered to maintain pre-transfusion Hb level of 7 g/dL and iron chelation therapy should be provided in case of iron overload. In addition,

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those who were diagnosed of having severe thalassemia should be given high transfusion.

2. If it possible, to better facilitate these patients, hospital should offer thalassemia clinic on holiday or outside the official office hour, in order to prevent thalassemia children from missing school.

3. In epidemic area, such as northeastern region of Thailand, training about thalassemia disease and screening program should be established.

4. To improve quality of care, hospital must not only have all kinds of medicine and medical supplies but also must have them in the sufficient amount.

For policy making

1. Regular thalassemia treatment should be offered in health insurance package since it showed to improve quality of life.

2. Prevention program including screening test in health check package of family planning or prenatal care should be provided.

Factors affecting the quality of life of children with Thalassemia

According to the result of this study, quality of life of children with thalassemia was significantly associated with various factors.

Socio-demographic factors

In support of previous research (9, 12, 13), this study found that age was significantly related to the quality of life of children with thalassemia. This finding showed that older thalassemia patients had better QOL than the younger patients. It is likely that older thalassemia patients learn to accept that they are going to live with thalassemia and learn how to cope with the disease. In addition, it might be the case that patients who were in severe condition whose quality of life were more likely to be low might have died since they were very young. So, the patients who were included in this study might be the representative of those who were not too severe. However, there was no significant difference between the QOL of thalassemia patients and the following factors; gender and being member of self-help group.

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Clinical characteristics

This study found that several factors of clinical predictors were related to the quality of life (QOL) of children with thalassemia. This finding showed that age onset of anemia, severity of disease (severe or non-severe), type of treatment (regular or non-regular treatment), the mean pre-transfusion Hb level for one year and pre-transfusion Hb level in the past 3 months before assessing QOL were significantly associated with the QOL of children with thalassemia.

Both age onset of anemia and pre-transfusion Hb level, clinical predictors for thalassemia, were related to the QOL (delay onset of anemia or higher pre-transfusion Hb level resulted in higher QOL scores). Age onset of anemia is one of the clinical predictor indicating that severity of thalassemia patients. The younger the patients started having anemia, the more likely they were severe. This finding revealed that the patients who started having anemia after 2 years old had higher QOL than those whose onset of anemia started before 2 years of age.

For Hb level, clinical predictor, it was expected that Hb level was positively related to the QOL (high Hb level, better QOL). As expected, this study confirmed that Hb level is an important predictor of the HRQOL among thalassemia children. It can be explained that Hb level was associated with degree of anemia. If the patients have too few red blood cells, or there is too little Hb in them, they have anemia. If the anemia is mild, it does no harm but if it is severe, the patients would feel ill due to the inadequate amount of oxygen supply (14). Accordingly, the regular treatment that keeps pre-transfusion Hb level up to 7 g/dL should be provided in order to improve patient's QOL.

Unsurprisingly, the findings indicated that severe thalassemia patients had significantly lower QOL scores than those who were non-severe. It can be explained that severe thalassemia patients may experience more health problems than those who are non-severe.

When comparing QOL scores by type of treatment, regular or non-regular treatment, the result showed that thalassemia patients who received regular treatment had higher QOL than those who received non-regular treatment. Regular treatment is consist of provision of transfusion when patient's pre-transfusion Hb level is less than 7 g/dL, give the iron chelation therapy when the serum ferritin level has risen above

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1000 ng/ml, and provide high transfusion (>13 times/year) for those who were diagnosed as having homozygous beta-thalassemia patients and those whose onset of anemia was less than 2 years of age who begin their transfusion before 4 years of age. The results confirmed that regular treatment should be provided to the patients to improve their QOL.

However, the present study found no significant difference between QOL of children with thalassemia and the following factors; diagnosis, age at first transfusion, hematocrit (Hct) level, frequency of blood transfusion, serum ferritin level, iron chelation therapy, spleen intact status and complications due to thalassemia.

Although this study indicated that homozygous beta-thalassemia patients tended to have lower QOL level than beta-thalassemia/Hb E and Hb H patients, respectively no significant difference between QOL and type of diagnosis was found. Based on the severity of disease, homozygous beta-thalassemia, the most severe thalassemia disease should have the lowest quality of life level due to the nature of disease itself and the treatment. The patients with homozygous beta-thalassemia need to receive regular blood transfusion approximately 1 time/month and receive iron chelation therapy via injection about 3-5 days/week depending on the serum ferritin level in the case of the serum ferritin level has risen above 1000 ng/ml which lead them to frequently miss school. On the contrary, Hb H disease is milder disease. The majority of the Hb H did not require blood transfusion so their quality of life should be higher. The non significant result in this study might be explained by the small number of patients who had homozygous beta-thalassemia since there is only 19 (5.3%) homozygous beta-thalassemia patients included in the study. So the study might not have enough statistical power to detect this difference if it exists.

Similar to the Hb level, hematocrit (Hct) level is also an important clinical predictor indicating the severity of disease. However, they were less prefer than Hb level than Hct level. Besides, in this analysis Hct level were not examined among the patients who were recruited from King Chulalongkorn Memorial (CU) Hospital. As the result the number of patients whose Hct level were determined was small. Consequently, no significantly difference between Hct level and QOL scores in total and physical domains of children-rated was found. Nevertheless, this study found that

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all domains of parent-rated and psychosocial domain of children-rated QOL scores were significantly associated with Hct level (higher Hct level, better QOL).

The frequency of blood transfusion was not related to patient's QOL. When looking at transfused and non-transfused patients, the findings revealed that non-transfused patients tend to have better QOL than those who received transfusion. It is possible that non-transfused patients may have mild anemia so they do not require transfusion meanwhile transfused patients generally have severe anemia and require regular blood transfusion to survive. In support of previous research (11, 15), transfused patients were lower QOL than non-transfused patients. In addition, Pakbaz et al. (11) had found that transfused patients reported impairment in emotional domain. It is certainly that transfused patients got pain from blood transfusion, in the long-term, iron overload can be occur in the patients who regularly transfusion so they need to receive iron chelation via injection about 3-5 times per week depending on the serum ferritin level. It could be explained as those who received no transfusion might be less severe than those who received blood transfusion so their quality of life were higher. However, in some cases that transfusion is required (Hb < 7 mg/dL), patients should get transfused in order to improve Hb level up to normal and hence improve QOL.

Existing studies were inconclusively reporting that iron chelation therapy can improve QOL of the patients with thalassemia (16) while some studies indicating that such therapy decreased quality of life of the patients (15, 17-19). Although no significantly difference between HRQOL scores and iron chelation therapy was found in this study, the finding revealed that the patients who received iron chelation by injection tend to have lower HRQOL scores than the patients who did not received iron chelation. Iron overload might be the result of blood transfusion. Long term iron overload leads to the mortality of the patients due to the damage in several organs such as heart and kidney. Several studies indicated that iron chelation therapy can prevent complication and improve long term prolong survival. On the other hand, due to the inconvenience, uncomfortable and side effects of the treatment, it is probable that iron overload therapy with infusion limits their QOL. Similar to the previous studies (17, 20) suggested that patient's activities were often or very often prevented due to Desferrioxamine (DFO) treatment and they were low satisfaction with infusion. In

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this study, the relationship between iron chelation therapy and the HRQOL scores did not exist probably due to the fact that there was very small complication detected in the patients so the benefit of iron chelation was not clearly found.

Furthermore, a previous study (2) had found that lower ferritin levels were associated with a lower probability of experiencing heart failure and with prolonged survival. However, no significantly difference was found between QOL and serum ferritin level in our study. It is possible that complication due to the effect of iron overload will be developed later in life while the complications due to iron overload are rarely found in this study. This also explains why significantly difference between QOL and complication was not found.

When comparing the QOL of the patients with spleen intact, parent-rated but not children-rated QOL scores were significantly associated with spleen intact status (those who had no spleen intact had lower QOL score). This finding conflict with the fact that splenectomy should be perform when spleen get bigger. It is likely that in the case of no spleen intact the children required more attention from the patients since they were easily infection. These children must take daily dose of penicillin to prevent some bacterial infections. As the result, parents might be worried about their child's health so they reported impairment in QOL of their child.

Other factors

Although, type of hospital and type of payment had potential to be the factors affecting on the patients quality of life, no significant difference in HRQOL was found across these factors.

When considering type of hospital, no significantly difference between patients who were recruited from center hospital and those who were recruited from university hospital was found. However, the patients who were recruited from university hospital were more likely to report better QOL than those who were recruited from the center hospital. This may be due to the fact that university hospital did not only have more specialist physicians and healthcare team, but also have more advance equipment, medical supply, and adequacy amount blood for transfusion.

According to type of payment, there was no significantly difference among the patients who were under universal coverage health scheme, CSMBS, and out of

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pocket. However, the patients who were under CSMBS were tended to report better QOL than the other groups.

Determination of the factors affecting the health-related quality of life of children with thalassemia using multiple regression analysis

The analysis on factors affecting the health-related quality of life of children with thalassemia was conducted using multiple regression. These variables were analyzed by the Stepwise Method. Those six factors were age, onset of anemia, diagnosis groups (Hb H and Non H), pre-transfusion Hb level in the past 3 months before assessing QOL, treatment status and type of hospital. According to the analysis, there were only three factors that could predict the total mean QOL score for child self-report; which were age, pre-transfusion Hb level in the past 3 months before assessing QOL and regular treatment. As shown in the analysis, age, pre-transfusion Hb level and regular treatment were positively related to positive total mean score of the QOL. For age, it could be explained that when the thalassemia patients grew up, it was possible that they could better cope with the disease and treatment. In the support of previous studies (9, 12, 13), it was found that thalassemia has different impact on different ages.

As expected, this finding found that if the thalassemia patients had high level of hemoglobin, it was likely that they would have better quality of life. In addition, providing regular treatment which included maintaining patient's pre-transfusion Hb level up to 7 g/dL, gave iron chelation therapy when serum ferritin level were above 1000 ng/ml, and provided high transfusion (>13 times/year) in case of severe thalassemia patients could improve patient's quality of life.

Limitation of the study

This study has limitation as the following;

1. Cross-sectional study was conducted in this study. Therefore, the long-term effect of complication and iron overload on HRQOL might not be detectable in this study.
2. No control group was examined on this study so we could not compare the quality of life between thalassemia children and healthy children.

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3. Definition of severe VS non-severe, and regular VS non-regular treatment used in this study was defined specifically for this study, therefore, the comparison across studies should be made with caution.

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CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

The objectives of this study were to assess the health-related quality of life (HRQOL) of thalassemia patients and to explore factors affecting on their quality of life. Moreover, this research examined the satisfaction of thalassemia patients or their parents utilizing healthcare service.

Three hundred and sixty two thalassemia patients who met the eligibility criteria were recruited in this study from 3 treatment centers. About 53.2%, 41.5%, and 5.3%, of the patients were diagnosed with beta-thalassemia/Hb E, HbH, and homozygous beta-thalassemia, respectively. Approximately 57 percent of all patients were covered by universal coverage health scheme, 17% were covered by CSMBS, and 26% were covered by out of pocket.

In this study, patients were classified as severe if they met at least one of the following criteria 1) patients whose onset of anemia were before 2 years and first transfusion occurred before 4 years of age, 2) patients who were diagnosed as homozygous beta-thalassemia, 3) patients whose pre-transfusion Hb level was lower than 7 g/dL. According to these criteria, 124 (34.3%) patients were classified as severe while 238 (65.7%) patients were classified as non-severe.

Patients were classified as receiving non-regular treatment if they met at least one of the following criteria;

1. Patients whose pre-transfusion Hb level was lower than 7 g/dL, who received no blood transfusion
2. Patients whose serum ferritin level was higher than 1000 ng/ml, who did not receive iron chelation therapy
3. Patients whose onset of anemia was before 2 years and first transfusion occurred before 4 years of age, who did not receive high transfusion
4. Patients who had diagnosed as having homozygous beta-thalassemia, who did not receive high transfusion

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Using these criteria mentioned above, 263 (73.5%) patients received regular treatment while 95 (26.5%) patients received non-regular treatment

Health-related quality of life

The quality of life of thalassemia children were assessed using the PedsQL 4.0 generic core scale (Thai version). The mean (SD) total HRQOL score of children with thalassemia was 76.67 (11.40) in child self-report and 74.69 (14.42) in parent proxy report, respectively. When looking at each domain of HRQOL, the results showed that these children indicated having some impairment in physical domain, as shown in the score of 78.24 ± 14.77. In psychosocial domain, school functioning score was the least (67.89 ± 15.92), followed by emotional functioning score (75.90 ± 16.62) and social functioning score (83.71 ± 14.73). The parent proxy-report HRQOL scores were found to be significantly lower than those of their children-reported. In this study, school domain has the highest impact on thalassemia patient's QOL because they had to frequently attend the hospital for follow-up treatment, which sometimes took a whole day, consequently, they were absent from school.

This study found that several factors were related to the quality of life (QOL) of children with thalassemia. This finding indicated that HRQOL of patients were found to be significantly different across age, age onset of anemia, severity of disease (severe or non-severe), type of treatment (regular or non-regular treatment) and pre-transfusion Hb level. According the analysis, older thalassemia patients were better QOL than those of younger. Both age onset of anemia and Hb level, clinical predictors for thalassemia, were related to the QOL. As expected, delay onset of anemia or higher Hb level resulted in higher QOL scores. Unsurprisingly, the findings indicated that severe thalassemia patients had significantly lower QOL scores than those who were non-severe. Moreover, it was also found that thalassemia patients who received regular treatment had better QOL than those received non-regular treatment.

Multiple regression was conducted to determine factors affecting the health-related quality of life of children with thalassemia. With this analysis the dependent variable was the total mean QOL score for child self-report. Stepwise Method was used in this analysis. According to the analysis, significant predictors of HRQOL of

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children with thalassemia were age, pre-transfusion Hb level and treatment status. It was confirmed that age and pre-transfusion Hb level were positively related to HRQOL level. In addition, the patients who received regular treatment were more likely to report higher level of HRQOL, as compared to those who received non-regular treatment.

Patient's satisfaction utilizing healthcare service

Thalassemia patients and their parents have high expectation on service quality especially they expected that hospital must have all kinds of medicine and medical supplies and medical devices in the sufficient amount, and that correct and suitable treatment were offered. On the other hand, they were less likely to expect for the speed services received. After utilizing healthcare service, they were more likely to satisfy with healthcare team as indicated that they were satisfied because doctors, nurses and other offices were interested in the symptom of their children, provided care with empathy, and had good skill. However, they were less satisfied with the speed and process of service received. Satisfaction questionnaires also revealed that there was no significant in satisfaction level across treatment center and payment status.

Recommendations

The results can provide better understanding of health status of children and adolescents with thalassemia. This information includes patients' quality of life and satisfaction with healthcare service utilization. In addition, by knowing quality of life, factors associated with quality of life and satisfaction about health service among these patients can help assisting in clinical and policy decision-making with the goal to improve HRQOL and satisfaction of patients.

According to the result, the regular treatment for thalassemia can improve patient's quality of life, therefore, regular treatment should be provided for all patients. In this study, regular treatment consists of providing regular blood transfusions for those whose pre-transfusion Hb < 7 g/dL, giving iron chelation therapy when serum ferritin level has risen above 1000 ng/ml in order to prevent the complications due to iron overload, and providing high transfustion for 1) who had diagnosed with

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homozygous beta-thalassemia and 2) those whose onset of anemia started before 2 years of age and first transfusion started before 4 years of age.

As indicated that HRQOL was the predictor of morbidity and mortality, more attention should be pay to severe thalassemia patients to improve their HRQOL (i.e. those with pre-transfusion Hb level lower than 7g/dL, those diagnosed with homozygous beta thalassemia, and those whose onset of disease was before two years old whom first transfusion occurred before four years old) since they reported lower quality of life.

As reported in the study that psychosocial domain were also affected among these patients, therefore psychosocial support should be provided to improve Emotional Intelligence Quotient (EQ) of these children, and hence lead to improvement in their QOL.

For policy maker, special plan aims to provide sufficient amount of regular treatment for the patients should be developed. Accessibility to adequate amount of blood and iron chelation therapy should be improved, especially in upcountry area. Furthermore, the prevention of new cases thalassemia is very important. In long-term, the screening test should be included in the health check package of schools and provided the necessary information along with the results so that it may be primary information before choosing a partner for marriage.

According to the result of patient's satisfaction on healthcare service, hospital must not only have all kinds of medicine and medical supplies but must also have them in the sufficient amount. Although, patients did not expect to receive service rapidly because they might already got used to this situation, they were frequently absent from school to go to hospitals for treatment and follow-up for the whole day. Consequently, the impairment in school domain was indicated in our study. Therefore, having thalassemia clinic on holiday or outside the official hours, if possible, could prevent them from absence from school and hence improve their quality of life especially in the school domain.

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REFERENCES

1. Abetz L, Baladi JF, Jones P, Rofail D. The impact of iron overload and its treatment on quality of life: results from a literature review. Health Qual Life Outcomes 2006;4:73.
2. De Sanctis V, Roos M, Gasser T, Fortini M, Raiola G, Galati MC. Impact of long-term iron chelation therapy on growth and endocrine functions in thalassaemia. J Pediatr Endocrinol Metab 2006;19(4):471-80.
3. Caro JJ, Ward A, Green TC, Huybrechts K, Arana A, Wait S, et al. Impact of thalassemia major on patients and their families. Acta Haematol 2002;107(3):150-7.
4. Cohen AR, Galanello R, Pennell DJ, Cunningham MJ, Vichinsky E. Thalassemia. Hematology Am Soc Hematol Educ Program 2004:14-34.
5. Multicenter study on prevalence of endocrine complications in thalassaemia major. Italian Working Group on Endocrine Complications in Non-endocrine Diseases. Clin Endocrinol (Oxf) 1995;42(6):581-6.
6. Lorey F. Asian immigration and public health in California: thalassemia in newborns in California. J Pediatr Hematol Oncol 2000;22(6):564-6.
7. Lorey F, Charoenkwan P, Witkowska HE, Lafferty J, Patterson M, Eng B, et al. Hb H hydrops foetalis syndrome: a case report and review of literature. Br J Haematol 2001;115(1):72-8.
8. Angastiniotis M, Modell B. Global epidemiology of hemoglobin disorders. Ann N Y Acad Sci 1998;850:251-69.
9. เสถียร สุขพาณิชนันท์. มูลนิธิโรคโลหิตจางธาลัสซีเมียแห่งประเทศไทย Available from: www.thalassemia.or.th/thaiversion/diag-carrier-th.htm. [Accessed 31 ตุลาคม 2549].
10. Trent RJ. Diagnosis of the haemoglobinopathies. Clin Biochem Rev 2006;27(1):27-38.
11. Telfer P, Constantinidou G, Andreou P, Christou S, Modell B, Angastiniotis M. Quality of life in thalassemia. Ann N Y Acad Sci 2005;1054:273-82.

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12. Ismail A, Campbell MJ, Ibrahim HM, Jones GL. Health Related Quality of Life in Malaysian children with thalassaemia. Health Qual Life Outcomes 2006;4:39.
13. Matza LS, Swensen AR, Flood EM, Secnik K, Leidy NK. Assessment of health-related quality of life in children: a review of conceptual, methodological, and regulatory issues. Value Health 2004;7(1):79-92.
14. Shumaker S, Berzon R. The international assessment of HRQL. Theory, translations, measurement and analysis.: Oxford: Rapid Communications; 1995.
15. Spilker B. Quality of life and pharmacoeconomics in clinical trials second ed. Philadelphia: Lippincott-Raven Publishers; 1996.
16. Seid M, Varni JW, Kurtin PS. Measuring quality of care for vulnerable children: challenges and conceptualization of a pediatric outcome measure of quality. Am J Med Qual 2000;15(4):182-8.
17. Bowling A. Current state of the art in quality of life meaurement London: BMJ Books; 2003.
18. Clarke S, Eiser C. The measurement of health-related quality of life (QOL) in pediatric trials: a systemic review. 2004;6:66.
19. Pakbaz Z, Treadwell M, Yamashita R, Quirolo K, Foote D, Quill L, et al. Quality of life in patients with thalassemia intermedia compared to thalassemia major. Ann N Y Acad Sci 2005;1054:457-61.
20. Aydinok Y, Erermis S, Bukusoglu N, Yilmaz D, Solak U. Psychosocial implications of Thalassemia Major. Pediatr Int 2005;47(1):84-9.
21. Vichinsky E. Report of proceedings: International conference on E-B thalassemia. J Pediatr Hematol Oncol 2000;22:550-601.
22. Texas DoSHS. Newborn Screening Case Management. Texas Department of State Health Services Available from: http://www.dshs.state.tx.us/newborn /cooley.shtm. [Accessed 3 Jan 2007].
23. Ong-ajyooth L, Malasit P, Ong-ajyooth S, Fucharoen S, Pootrakul P, Vasuvattakul S, et al. Renal function in adult beta-thalassemia/Hb E disease. Nephron 1998;78(2):156-61.
24. Eleftheriou A. About thalassaemia. Cyprus: Thalassaemia International Federation; 2003.

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25. Taher A, Sheikh-Taha M, Koussa S, Inati A, Neeman R, Mourad F. Comparison between deferoxamine and deferiprone (L1) in iron-loaded thalassemia patients. Eur J Haematol 2001;67(1):30-4.
26. Olivieri NF. Long-term followup of body iron in patients with thalassemia major during therapy with the orally active iron chelator deferiprone (L1). Blood 1996;88:310a.
27. Cappellini MD, Cohen A, Piga A, Bejaoui M, Perrotta S, Agaoglu L, et al. A phase 3 study of deferasirox (ICL670), a once-daily oral iron chelator, in patients with beta-thalassemia. Blood 2006;107(9):3455-62.
28. คณะทำงานจัดทำมาตรฐานแนวทางการดูแลรักษาผู้ป่วยโรคธาลัสซีเมีย แนวทางการวินิจฉัยและการรักษาโรคโลหิตจางธาลัสซีเมีย(Clinical practice guidelines for diagnosis and management of thalassemia syndromes). 1 ed. กรุงเทพมหานคร: กรมการแพทย์; 2549.
29. Weatherall DJ, Clegg JB. Inherited haemoglobin disorders: an increasing global health problem Bull World Health organ 2001;79:704-712.
30. WHO. Constitution of the World Health Organization. WHO Basic Documents Geneva; 1948.
31. Staquet MJ, Hays RD, Fayers PM. Quality of ife assessment in clinical trials methods and practice. New York: Oxford University Press 1998.
32. Eiser C, Morse R. Quality-of-life measures in chronic diseases of childhood. Health Technol Assess 2001;5(4):1-157.
33. Eiser C, Mohay H, Morse R. The measurement of quality of life in young children. Child Care Health Dev 2000;26(5):401-14.
34. Wallander JL, Schmitt M, Koot HM. Quality of life measurement in children and adolescents: issues, instruments, and applications. J Clin Psychol 2001;57(4):571-85.
35. Leidy NK, Rich M, Geneste B. Recommendations for evaluation the validity of quality of life claims for labeling and promotion. Value Health 1999;2:113-127.
36. Landgraf JM, Abetz LN. Quality of life and pharmacoeconomics in clinical trials second ed. Philadelphia: Lippincott-Raven Publishers; 1996.

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37. Eiser C, Morse R. Can parents rate their child's health-related quality of life? Results of a systematic review. Qual Life Res 2001;10(4):347-57.
38. Marra CA, Levine M, McKerrow R. Overview of health-related quality-of-life measures for pediatric patients: application in the assessment of pharmacotherapeutic and pharmacoeconomic outcomes. Pharmacotherapy 1996;16:879-888.
39. French DJ, Christie MJ, Sowden AJ. The reproducibility of the Childhood Asthma Questionnaires: measures of quality of life for children with asthma aged 4-16 years. Qual Life Res 1994;3(3):215-24.
40. Ingersoll GM, Marrero DG. A modified quality-of-life measure for youths: psychometric properties. Diabetes Educ 1991;17(2):114-8.
41. Rabbett H, Elbadri A, Thwaites R, Northover H, Dady I, Firth D, et al. Quality of life in children with Crohn's disease. J Pediatr Gastroenterol Nutr 1996;23(5):528-33.
42. Varni JW, Burwinkle TM, Katz ER, Meeske K, Dickinson P. The PedsQL in pediatric cancer: reliability and validity of the Pediatric Quality of Life Inventory Generic Core Scales, Multidimensional Fatigue Scale, and Cancer Module. Cancer 2002;94(7):2090-106.
43. Juniper EF, Guyatt GH, Feeny DH, Ferrie PJ, Griffith LE, Townsend M. Measuring quality of life in children with asthma. Qual Life Res 1996;5(1):35-46.
44. Christie MJ, French D, Sowden A, West A. Development of child-centered disease-specific questionnaires for living with asthma. Psychosom Med 1993;55(6):541-8.
45. Juniper EF, Howland WC, Roberts NB, Thompson AK, King DR. Measuring quality of life in children with rhinoconjunctivitis. J Allergy Clin Immunol 1998;101(2 Pt 1):163-70.
46. Parkin PC, Kirpalani HM, Rosenbaum PL, Fehlings DL, Van Nie A, Willan AR, et al. Development of a health-related quality of life instrument for use in children with spina bifida. Qual Life Res 1997;6(2):123-32.

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47. Varni JW, Burwinkle TM, Lane MM. Health-related quality of life measurement in pediatric clinical practice: an appraisal and precept for future research and application. Health Qual Life Outcomes 2005;3:34.
48. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. Med Care 2001;39(8):800-12.
49. Chan KS, Mangione-Smith R, Burwinkle TM, Rosen M, Varni JW. The PedsQL: reliability and validity of the short-form generic core scales and Asthma Module. Med Care 2005;43(3):256-65.
50. McCarthy ML, MacKenzie EJ, Durbin DR, Aitken ME, Jaffe KM, Paidas CN, et al. The Pediatric Quality of Life Inventory: an evaluation of its reliability and validity for children with traumatic brain injury. Arch Phys Med Rehabil 2005;86(10):1901-9.
51. Varni JW. The PedsQL Measurement Model for the Pediatric Quality of Life Inventory. Available from: http://www.pedsql.org/translations.html. [Accessed 4 Jan 2007].
52. Pongwilairat K, Louthrenoo O, Charnsil C, Witoonchart C. Quality of life of children with attention-deficit/hyper activity disorder. J Med Assoc Thai 2005;88(8):1062-6.
53. Parasuraman A, Zeithaml VA, Berry LL. Delivery quality service: Balancing customer perceptions and expectations. New York: The Free Press; 1990.
54. Aday LA, Andersen R. Development of indices of access to medical care. Ann Arbor Michigan: Health Administration Press; 1975.
55. Millett JD. Management in the public service. New York: Mc Graw-Hill Book Company; 1954.
56. Aday LA, Andersen R. A framework for the study of access to medical care. Health Serv Res 1974;9(3):208-20.
57. Upton P, Eiser C, Cheung I, Hutchings HA, Jenney M, Maddocks A, et al. Measurement properties of the UK-English version of the Pediatric Quality of Life Inventory 4.0 (PedsQL) generic core scales. Health Qual Life Outcomes 2005;3:22.

Copyright by Mahidol University

58. Mikelli A, Tsiantis J. Brief report: Depressive symptoms and quality of life in adolescents with b-thalassaemia. J Adolesc 2004;27(2):213-6.
59. Sosothikul D. The correlation between psychosocial and financial aspects in children with thalassemia at Chulalongkorn Hospital and parental attitudes. Bangkok: Chulalongkorn University; 1999.
60. Wang CH, Wu KH, Tsai FJ, Peng CT, Tsai CH. Comparison of oral and subcutaneous iron chelation therapies in the prevention of major endocrinopathies in beta-thalassemia major patients. Hemoglobin 2006;30(2):257-62.
61. Basran R, Fasson F, Shaw D, Olivieri N. Assessment of the relative quality of life in patients receiving subcutaneous deferoxamine and the orally active iron chelating agent L1. Blood 1994;84:261a.
62. Lwanga SK, Lemeshow S. Sample size determination in health studies a practical manual. Geneva: World Health Organization; 1991.
63. กัลยา วานิชย์บัญชา. การวิเคราะห์สถิติขั้นสูงด้วย SPSS for Windows. กรุงเทพฯ: ศูนย์หนังสือแห่งจุฬาลงกรณ์มหาวิทยาลัย; 2546.
64. Varni J. PedsQLTM Translation methodology. Available from: http://www.pedsql.org. [Accessed 10 April 2006]
65. Varni JW. Linguistic validation of the PedsQLTM-a Quality of Life Questionnaire. Mapi Research Institute Available from: [Accessed 10 April 2006]
66. Rino V, Bernadette M, Evgenia G. What is thalassaemia? second ed. Cyprus: The thalassaemia international federation; 1995.
67. Borgna-Pignatti C, Cappellini MD, De Stefano P, Del Vecchio GC, Forni GL, Gamberini MR, et al. Survival and complications in thalassemia. Ann N Y Acad Sci 2005;1054:40-7.
68. Schwimmer JB, Burwinkle TM, Varni JW. Health-related quality of life of severely obese children and adolescents. Jama 2003;289(14):1813-9.
69. Varni JW, Burwinkle TM, Jacobs JR, Gottschalk M, Kaufman F, Jones KL. The PedsQL in type 1 and type 2 diabetes: reliability and validity of the Pediatric Quality of Life Inventory Generic Core Scales and type 1 Diabetes Module. Diabetes Care 2003;26(3):631-7.

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70. Varni JW, Burwinkle TM, Limbers CA, Szer IS. The PedsQL as a patient-reported outcome in children and adolescents with fibromyalgia: an analysis of OMERACT domains. Health Qual Life Outcomes 2007;5:9.
71. Sawyer MG, Whaites L, Rey JM, Hazell PL, Graetz BW, Baghurst P. Health-related quality of life of children and adolescents with mental disorders. J Am Acad Child Adolesc Psychiatry 2002;41(5):530-7.
72. Varni JW, Burwinkle TM. The PedsQL as a patient-reported outcome in children and adolescents with Attention-Deficit/Hyperactivity Disorder: a population-based study. Health Qual Life Outcomes 2006;4:26.
73. Khurana A, Katyal S, Marwaha RK. Psychosocial burden in thalassemia. Indian J Pediatr 2006;73(10):877-80.

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APPENDIX

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Appendix A

Reliability of the instrument

1. The PedsQL 4.0 generic core scales

   Reliability for child self-report

   N of cases = 314 N of items = 23

   Alpha = 0.819

   Reliability for parent proxy-report

   N of cases = 346 N of items = 23

   Alpha = 0.886

2. The expectation questionnaire

   Reliability for expectation utilizing healthcare service

   N of cases = 362 N of items = 18

   Alpha = 0.814

3. The satisfaction questionnaire

   Reliability for satisfaction utilizing healthcare service

   N of cases = 362 N of items = 18

   Alpha = 0.832

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Appendix B

Output of multiple regression analysis in the factor affecting the HRQOL of children with thalassemia

Descriptive Statistics

	Mean	Std. Deviation	N
Total mean score (child self-report)	76.2772	11.37680	240
age(Y)	9.95	3.413	240
optimal treatment	.73	.443	240
age onset	3.66	2.595	240
Hb level in the past 3 months before assessing QOL	8.024	1.2177	240

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Correlations

		Total mean score (child self-report)	age(Y)	optimal treatment	age onset	Hb level in the past 3 months before assessing QOL
Pearson Correlation	Total mean score (child self-report)	1.000	.276	.167	.118	.198
	age(Y)	.276	1.000	.010	.258	-.022
	optimal treatment	.167	.010	1.000	.353	.181
	age onset	.118	.258	.353	1.000	.078
	Hb level in the past 3 months before assessing QOL	.198	-.022	.181	.078	1.000
Sig. (1-tailed)	Total mean score (child self-report)	.	.000	.005	.034	.001
	age(Y)	.000	.	.440	.000	.365
	optimal treatment	.005	.440	.	.000	.002
	age onset	.034	.000	.000	.	.114
	Hb level in the past 3 months before assessing QOL	.001	.365	.002	.114	.
N	Total mean score (child self-report)	240	240	240	240	240
	age(Y)	240	240	240	240	240
	optimal treatment	240	240	240	240	240
	age onset	240	240	240	240	240
	Hb level in the past 3 months before assessing QOL	240	240	240	240	240

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Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	age(Y)	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Hb level in the past 3 months before assessing QOL	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	optimal treatment	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: Total mean score (child self-report)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.276[a]	.076	.072	10.95794	.076	19.620	1	238	.000
2	.344[b]	.118	.111	10.72906	.042	11.263	1	237	.001
3	.367[c]	.135	.124	10.64915	.017	4.570	1	236	.034

a. Predictors: (Constant), age(Y)

b. Predictors: (Constant), age(Y), Hb level in the past 3 months before assessing QOL

c. Predictors: (Constant), age(Y), Hb level in the past 3 months before assessing QOL, optimal treatment

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ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2355.922	1	2355.922	19.620	.000[a]
	Residual	28578.211	238	120.077		
	Total	30934.133	239			
2	Regression	3652.426	2	1826.213	15.865	.000[b]
	Residual	27281.707	237	115.113		
	Total	30934.133	239			
3	Regression	4170.714	3	1390.238	12.259	.000[c]
	Residual	26763.418	236	113.404		
	Total	30934.133	239			

a. Predictors: (Constant), age(Y)

b. Predictors: (Constant), age(Y), Hb level in the past 3 months before assessing QOL

c. Predictors: (Constant), age(Y), Hb level in the past 3 months before assessing QOL, optimal treatment

d. Dependent Variable: Total mean score (child self-report)

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Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	67.128	2.183		30.748	.000	62.828	71.43		
	age(Y)	.920	.208	.276	4.429	.000	.511	1.329	1.000	1.000
2	(Constant)	51.624	5.090		10.142	.000	41.596	61.65		
	age(Y)	.935	.203	.281	4.598	.000	.535	1.336	.999	1.001
	Hb level in the pas 3 months before assessing QOL	1.913	.570	.205	3.356	.001	.790	3.036	.999	1.001
3	(Constant)	50.994	5.061		10.076	.000	41.024	60.96		
	age(Y)	.929	.202	.279	4.602	.000	.531	1.327	.999	1.001
	Hb level in the pas 3 months before assessing QOL	1.690	.575	.181	2.938	.004	.557	2.824	.967	1.034
	optimal treatment	3.379	1.581	.132	2.138	.034	.265	6.493	.967	1.034

a. Dependent Variable: Total mean score (child self-report)

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Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	optimal treatment	.164[a]	2.672	.008	.171	1.000	1.000	1.000
	age onset	.050[a]	.776	.438	.050	.934	1.071	.934
	Hb level in the past 3 months before assessing QOL	.205[a]	3.356	.001	.213	.999	1.001	.999
2	optimal treatment	.132[b]	2.138	.034	.138	.967	1.034	.967
	age onset	.032[b]	.503	.616	.033	.927	1.079	.927
3	age onset	-.018[c]	-.268	.789	-.017	.810	1.234	.810

a. Predictors in the Model: (Constant), age(Y)

b. Predictors in the Model: (Constant), age(Y), Hb level in the past 3 months before assessing QOL

c. Predictors in the Model: (Constant), age(Y), Hb level in the past 3 months before assessing QOL, optimal treatment

d. Dependent Variable: Total mean score (child self-report)

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Appendix C

The PedsQL Questionnaires

ลำดับที่ _____

วันที่: _____

PedsQL™

แบบสอบถามคุณภาพชีวิตเด็ก

รุ่นที่ 4.0 – ภาษาไทย

รายงานของผู้ปกครองสำหรับเด็กเล็กมาก (อายุ 2-4 ปี)

คำชี้แจง

ในหน้าถัดไปมีรายการของเรื่องต่างๆ ที่อาจเป็นปัญหากับ **เด็ก ของคุณ**
ช่วยบอกเราว่าเรื่องแต่ละเรื่องนั้นเป็น**ปัญหากับเด็ก ของคุณมากเท่าใด ในช่วง 1 เดือนที่ผ่านมา** โดยวงกลมรอบ

เลข 0 ถ้ามัน**ไม่เป็นปัญหาเลย**
เลข 1 ถ้ามัน**เกือบไม่เป็นปัญหาเลย**
เลข 2 ถ้ามันเป็นปัญหา**บ้างเป็นครั้งคราว**
เลข 3 ถ้ามันเป็นปัญหา**บ่อย**
เลข 4 ถ้ามันเป็นปัญหา**เกือบตลอดเวลา**

คำตอบเหล่านี้ไม่มีคำตอบที่ถูกหรือผิด
ถ้าคุณไม่เข้าใจคำถามโปรดถามเพื่อขอความช่วยเหลือ

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ในช่วง 1 เดือนที่ผ่านมา เด็กของคุณมีปัญหาเกี่ยวกับสิ่งเหล่านี้มากเพียงใด...

ด้านกายภาพ (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การเดิน	0	1	2	3	4
2. การวิ่ง	0	1	2	3	4
3. การเล่นที่ต้องเคลื่อนไหวร่างกายหรือการออกกำลังกาย	0	1	2	3	4
4. การยกของหนัก	0	1	2	3	4
5. การอาบน้ำ	0	1	2	3	4
6. การช่วยเก็บของเล่นของเขาหรือของเธอ	0	1	2	3	4
7. รู้สึกปวด	0	1	2	3	4
8. รู้สึกไม่ค่อยมีเรี่ยวแรง	0	1	2	3	4

ด้านอารมณ์ (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. รู้สึกกลัว	0	1	2	3	4
2. รู้สึกเศร้า	0	1	2	3	4
3. รู้สึกโกรธ	0	1	2	3	4
4. นอนไม่ค่อยหลับ	0	1	2	3	4
5. รู้สึกวิตกกังวล	0	1	2	3	4

ด้านสังคม (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การเล่นกับเด็กคนอื่นๆ	0	1	2	3	4
2. เด็กคนอื่นๆ ไม่ต้องการเล่นกับเขาหรือเธอ	0	1	2	3	4
3. การถูกเด็กคนอื่นๆล้อ	0	1	2	3	4
4. การไม่สามารถทำสิ่งต่างๆ ที่เด็กคนอื่นในวัยเดียวกับเขาหรือเธอสามารถทำได้	0	1	2	3	4
5. การเล่นได้ทันกับเด็กคนอื่นๆ	0	1	2	3	4

* กรุณาตอบส่วนนี้หากลูกคุณเข้าโรงเรียนหรือสถานรับเลี้ยงเด็กตอนกลางวันแล้ว

ด้านโรงเรียน (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การทำกิจกรรมต่างๆของโรงเรียนได้เหมือนกับเพื่อนๆ	0	1	2	3	4
2. การขาดโรงเรียน (หรือสถานรับเลี้ยงเด็ก) เพราะรู้สึกไม่สบาย	0	1	2	3	4
3. การขาดโรงเรียน (หรือสถานรับเลี้ยงเด็ก) เพื่อไปหาหมอ หรือไปโรงพยาบาล	0	1	2	3	4

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วันที่: _____

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แบบสอบถามคุณภาพชีวิตเด็ก

รุ่นที่ 4.0 ภาษาไทย

รายงานของเด็กเล็ก (อายุ **5-7 ปี**)

คำชี้แจงสำหรับผู้สัมภาษณ์

ฉัน (สรรพนามอื่นๆ ที่เหมาะสม) กำลังจะถามคำถามหนูเกี่ยวกับสิ่งต่างๆ ที่อาจเป็นปัญหากับเด็กบางคน ฉัน (สรรพนามอื่นๆ ที่เหมาะสม) อยากจะรู้ว่าสิ่งต่างๆ เหล่านี้อาจจะเป็นปัญหากับหนูมากแค่ไหน

แสดงแผ่นภาพให้เด็กดู และชี้ไปที่ตัวเลือกเหล่านั้นในขณะที่คุณอ่าน

ถ้ามันไม่เป็นปัญหาเลยสำหรับหนู ชี้ไปที่หน้ายิ้ม

ถ้ามันเป็นปัญหาบ้างเป็นครั้งคราวสำหรับหนู ชี้ไปที่หน้าตรงกลาง

ถ้าเป็นปัญหามากสำหรับหนู ชี้ไปที่หน้าบึ้ง

ฉัน (หรือสรรพนามอื่นๆ ที่เหมาะ สม) จะอ่านแต่ละคำถาม แล้วให้หนูชี้ไปที่รูปภาพให้ฉัน (หรือสรรพนามอื่นๆ ที่เหมาะ สม) ดูว่ามันเป็นปัญหากับหนูมากแค่ไหน เรามาลองทำแบบฝึกหัดแรกกัน

	ไม่เลย	เป็นบางครั้ง	มาก
มันยากมั้ยสำหรับหนูที่จะดีดนิ้ว	☺	😐	☹

บอกให้เด็กลองแสดงการดีดนิ้วของเขา หรือ เธอ เพื่อดูว่าเด็กตอบคำถามได้ถูกต้องหรือไม่ ถามคำถามซ้ำหากเด็กแสดงคำตอบที่แตกต่างไปจากการกระทำของเขา หรือ เธอ

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ให้ลิดดูว่าหนูเป็นอย่างไรบ้างในช่วง2-3 อาทิตย์ที่ผ่านมา ให้ตั้งใจฟังแต่ละประโยคให้ดีๆ แล้วบอกฉัน (สรรพนามที่เหมาะสม) ว่าสิ่งเหล่านี้เป็นปัญหากับหนูมากแค่ไหน

หลังจากอ่านแต่ละข้อเสร็จแล้ว ให้ชี้ไปที่แผนภาพ ถ้าเด็กลังเลหรือดูเหมือนไม่เข้าใจว่าจะตอบอย่างไร ให้อ่านตัวเลือกของคำตอบพร้อมกับชี้ไปที่รูปหน้านั้นๆ

ด้านกายภาพ (ปัญหาเกี่ยวกับ....)	ไม่เลย	เป็นบางครั้ง	มาก
1. มันยากมั้ยสำหรับหนูที่จะเดิน	0	2	4
2. มันยากมั้ยสำหรับหนูที่จะวิ่ง	0	2	4
3. มันยากมั้ยสำหรับหนูที่จะเล่นกีฬาหรือออกกำลังกาย	0	2	4
4. มันยากมั้ยสำหรับหนูที่จะยกของชิ้นใหญ่ๆ	0	2	4
5. มันยากมั้ยสำหรับหนูที่จะอาบน้ำด้วยตัวเอง	0	2	4
6. มันยากมั้ยสำหรับหนูที่จะทำงานบ้าน (เช่น เก็บของเล่นของหนู)	0	2	4
7. หนูรู้สึกปวดมั้ย (ที่ไหนบ้าง)	0	2	4
1. หนูรู้สึกเหนื่อยขนเล่นไม่ไหวบ้างมั้ย	0	2	4

จำได้มั้ย บอกฉัน (สรรพนามที่เหมาะสม) ชิว่าสิ่งนี้เป็นปัญหาสำหรับหนูมากแค่ไหนในช่วงหลายอาทิตย์ที่ผ่านมา

ด้านอารมณ์ (ปัญหาเกี่ยวกับ....)	ไม่เลย	เป็นบางครั้ง	มาก
1. หนูรู้สึกกลัวมั้ย	0	2	4
2. หนูรู้สึกเศร้ามั้ย	0	2	4
3. หนูรู้สึกโกรธมั้ย	0	2	4
4. หนูนอนไม่ค่อยหลับมั้ย	0	2	4
5. หนูกังวลว่าจะเกิดอะไรขึ้นกับตัวหนูมั้ย	0	2	4

ด้านสังคม (ปัญหาเกี่ยวกับ....)	ไม่เลย	เป็นบางครั้ง	มาก
1. มันยากมั้ยสำหรับหนูที่จะเข้ากับเด็กคนอื่น	0	2	4
2. เด็กคนอื่นๆ พูดว่าเขาไม่อยากเล่นกับหนูมั้ย	0	2	4
3. เด็กคนอื่นๆ ล้อหนูหรือเปล่า	0	2	4
4. เด็กคนอื่นๆ สามารถทำสิ่งต่างๆ ที่หนูทำไม่ได้ ได้หรือเปล่า	0	2	4
5. มันยากมั้ยสำหรับหนูที่จะเล่นให้ทันกับเพื่อนๆ	0	2	4

ด้านโรงเรียน(ปัญหาเกี่ยวกับ....)	ไม่เลย	เป็นบางครั้ง	มาก
1. มันยากมั้ยสำหรับหนูที่จะตั้งใจเรียนที่โรงเรียน	0	2	4
2. หนูลืมสิ่งต่างๆ มั้ย	0	2	4
3. มันยากมั้ยที่จะต้องตามบทเรียนให้ทัน	0	2	4
4. หนูหยุดเรียนเพราะรู้สึกไม่ค่อยสบายมั้ย	0	2	4
5. หนูหยุดเรียนเพราะต้องไปหาหมอหรือไปโรงพยาบาลมั้ย	0	2	4

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วันที่:_____

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แบบสอบถามคุณภาพชีวิตเด็ก

รุ่นที่ 4.0 ภาษาไทย

รายงานของผู้ปกครองสำหรับ**เด็กเล็ก** (อายุ **5-7 ปี**)

คำชี้แจง

ในหน้าถัดไปมีรายการของเรื่องต่างๆ ที่อาจเป็นปัญหากับ **เด็กเล็ก ของคุณ**

ช่วยบอกเราว่าเรื่องแต่ละเรื่องนั้นเป็น**ปัญหากับเด็กเล็กของคุณมากเท่าใด ในช่วง 1 เดือนที่ผ่านมา** โดยวงกลมรอบ

เลข 0 ถ้ามัน**ไม่เป็นปัญหาเลย**

เลข 1 ถ้ามัน**เกือบไม่เป็น**ปัญหาเลย

เลข 2 ถ้ามันเป็นปัญหา**บ้างเป็นครั้งคราว**

เลข 3 ถ้ามันเป็นปัญหา**บ่อย**

เลข 4 ถ้ามันเป็นปัญหา**เกือบตลอดเวลา**

คำตอบเหล่านี้ไม่มีคำตอบที่ถูกหรือผิด

ถ้าคุณไม่เข้าใจคำถาม โปรดถามเพื่อขอความช่วยเหลือ

ในช่วง 1 เดือนที่ผ่านมา เด็ก ของคุณมี**ปัญหา**เกี่ยวกับสิ่งเหล่านี้มากเพียงใด...

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ด้านกายภาพ (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การเดินมากกว่า 100 เมตร	0	1	2	3	4
2. การวิ่ง	0	1	2	3	4
3. การเล่นกีฬาหรือออกกำลังกาย	0	1	2	3	4
4. การยกของหนัก	0	1	2	3	4
5. การอาบน้ำด้วยตัวเอง	0	1	2	3	4
6. การทำงานบ้าน เช่น เก็บของเล่นของตัวเขาหรือตัวเธอ	0	1	2	3	4
7. รู้สึกปวด	0	1	2	3	4
8. ไม่ค่อยมีเรี่ยวแรง	0	1	2	3	4

ด้านอารมณ์ (ปัญหาเกี่ยวกับ...)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. รู้สึกกลัว	0	1	2	3	4
2. รู้สึกเศร้า	0	1	2	3	4
3. รู้สึกโกรธ	0	1	2	3	4
4. นอนไม่ค่อยหลับ	0	1	2	3	4
5. กังวลว่าอะไรจะเกิดขึ้นกับตัวเขาหรือตัวเธอ	0	1	2	3	4

ด้านสังคม (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การเข้ากับเด็กคนอื่นๆ	0	1	2	3	4
2. เด็กคนอื่นๆ ไม่ต้องการเป็นเพื่อนกับเขาหรือเธอ	0	1	2	3	4
3. การถูกเด็กคนอื่นๆล้อ	0	1	2	3	4
4. การไม่สามารถทำสิ่งต่างๆ ที่เด็กคนอื่นในวัยเดียวกับเขาหรือเธอสามารถทำได้	0	1	2	3	4
5. เล่นได้ทันกับเด็กคนอื่นๆ	0	1	2	3	4

ด้านโรงเรียน (ปัญหาเกี่ยวกับ..)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การมีสมาธิในห้องเรียน	0	1	2	3	4
2. การลืมสิ่งต่างๆ	0	1	2	3	4
3. การทำกิจกรรมต่างๆของโรงเรียนเสร็จได้ทัน	0	1	2	3	4
4. การขาดเรียนเพราะรู้สึกไม่สบาย	0	1	2	3	4
5. การขาดเรียนเพราะต้องไปหาหมอหรือไปโรงพยาบาล	0	1	2	3	4

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แบบสอบถามคุณภาพชีวิตเด็ก

รุ่นที่ 4.0 – ภาษาไทย

รายงานของวัยรุ่น (อายุ 13-18 ปี)

คำชี้แจง

ในหน้าถัดไปเป็นรายการของเรื่องต่างๆ ที่อาจเป็นปัญหากับคุณ
ช่วยบอกเราว่าเรื่องแต่ละเรื่องนั้นเป็น**ปัญหากับคุณมากเท่าใด** ในช่วง **1 เดือนที่ผ่านมา** โดยวงกลมรอบ

เลข 0 ถ้า**มันไม่เป็นปัญหาเลย**
เลข 1 ถ้ามัน**เกือบไม่เป็น**ปัญหาเลย
เลข 2 ถ้ามันเป็นปัญหา**บ้างเป็นครั้งคราว**
เลข 3 ถ้ามันเป็นปัญหา**บ่อย**
เลข 4 ถ้ามันเป็นปัญหา**เกือบตลอดเวลา**

คำตอบเหล่านี้ไม่มีคำตอบที่ถูกหรือผิด
ถ้าคุณไม่เข้าใจคำถามโปรดถามเพื่อขอความช่วยเหลือ .

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ในช่วง 1 เดือนที่ผ่านมา ข้อต่อไปนี้เป็นปัญหาต่อคุณ มากเพียงใด...

เกี่ยวกับสุขภาพและกิจกรรมต่างๆ (ปัญหาเกี่ยวกับ.....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การเดินมากกว่า 100 เมตร เป็นเรื่องยากลำบากสำหรับฉัน	0	1	2	3	4
2. การวิ่งเป็นเรื่องยากลำบากสำหรับฉัน	0	1	2	3	4
3. การเล่นกีฬาหรือออกกำลังกายเป็นเรื่องยากลำบากสำหรับฉัน	0	1	2	3	4
4. การยกของหนักเป็นเรื่องยากลำบากสำหรับฉัน	0	1	2	3	4
5. การอาบน้ำด้วยตัวเองเป็นเรื่องยากลำบากสำหรับฉัน	0	1	2	3	4
6. การทำงานบ้านเป็นเรื่องยากลำบากสำหรับฉัน	0	1	2	3	4
7. ฉันรู้สึกปวด	0	1	2	3	4
8. ฉันไม่ค่อยมีเรี่ยวแรง	0	1	2	3	4

เกี่ยวกับความรู้สึก(ปัญหาเกี่ยวกับ.....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. ฉันรู้สึกกลัว	0	1	2	3	4
2. ฉันรู้สึกเศร้า	0	1	2	3	4
3. ฉันรู้สึกโกรธ	0	1	2	3	4
4. ฉันนอนไม่ค่อยหลับ	0	1	2	3	4
5. ฉันกังวลว่าอะไรจะเกิดขึ้นกับฉัน	0	1	2	3	4

ฉันเข้ากับผู้อื่นได้อย่างไร(ปัญหาเกี่ยวกับ.....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. ฉันมีปัญหาในการเข้ากับเด็กวัยรุ่นคนอื่นๆ	0	1	2	3	4
2. เด็กวัยรุ่นคนอื่นๆ ไม่ต้องการเป็นเพื่อนกับฉัน	0	1	2	3	4
3. เด็กวัยรุ่นคนอื่นๆ ล้อฉัน	0	1	2	3	4
4. ฉันไม่สามารถทำอะไรที่เด็กวัยรุ่นอื่นวัยเดียวกันทำได้	0	1	2	3	4
5. มันเป็นเรื่องยากลำบากในการทำสิ่งต่างๆ ให้ทันเพื่อน	0	1	2	3	4

เกี่ยวกับโรงเรียน(ปัญหาเกี่ยวกับ.....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การมีสมาธิในห้องเรียนเป็นเรื่องยากลำยาก	0	1	2	3	4
2. ฉันลืมสิ่งต่างๆ	0	1	2	3	4
3. ฉันตามบทเรียนไม่ทัน	0	1	2	3	4
4. ฉันขาดเรียนเพราะรู้สึกไม่ค่อยสบาย	0	1	2	3	4
5. ฉันขาดเรียนเพื่อไปหาหมอหรือไปโรงพยาบาล	0	1	2	3	4

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แบบสอบถามคุณภาพชีวิตเด็ก

รุ่นที่ 4.0 – ภาษาไทย

รายงานของผู้ปกครองสำหรับวัยรุ่น (อายุ 13-18 ปี)

คำชี้แจง

ในหน้าถัดไปเป็นรายการของเรื่องต่างๆ ที่อาจเป็นปัญหากับเด็กวัยรุ่นของคุณ
ช่วยบอกเราว่าเรื่องแต่ละเรื่องนั้นเป็น**ปัญหากับเด็กวัยรุ่นของคุณมากเท่าใด** ในช่วง 1 **เดือนที่ผ่านมา** โดยวงกลมรอบ

เลข 0 ถ้ามัน**ไม่เป็นปัญหาเลย**
เลข 1 ถ้ามัน**เกือบไม่เป็นปัญหา**เลย
เลข 2 ถ้ามันเป็นปัญหา**บ้างเป็นครั้งคราว**
เลข 3 ถ้ามันเป็นปัญหา**บ่อย**
เลข 4 ถ้ามันเป็นปัญหา**เกือบตลอดเวลา**

คำตอบเหล่านี้ไม่มีคำตอบที่ถูกหรือผิด
ถ้าคุณไม่เข้าใจคำถาม โปรดถามเพื่อขอความช่วยเหลือ.

ในช่วง 1 **เดือนที่ผ่านมา** เด็กวัยรุ่นของคุณมี**ปัญหา**เกี่ยวกับสิ่งเหล่านี้มากเพียงใด.....

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ด้านกายภาพ (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การเดินมากกว่า 100 เมตร	0	1	2	3	4
2. การวิ่ง	0	1	2	3	4
3. การเล่นกีฬาหรือออกกำลังกาย	0	1	2	3	4
4. การยกของหนัก	0	1	2	3	4
5. การอาบน้ำด้วยตัวเอง	0	1	2	3	4
6. การทำงานบ้าน	0	1	2	3	4
7. มีการปวด	0	1	2	3	4
8. ไม่ค่อยมีเรี่ยวแรง	0	1	2	3	4

ด้านอารมณ์ (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. รู้สึกกลัวหรือหวาดกลัว	0	1	2	3	4
2. รู้สึกเศร้า	0	1	2	3	4
3. รู้สึกโกรธ	0	1	2	3	4
4. นอนไม่ค่อยหลับ	0	1	2	3	4
5. กังวลว่าจะเกิดอะไรขึ้นกับตัวเขาหรือตัวเธอ	0	1	2	3	4

ด้านสังคม (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การเข้ากับเด็กวัยรุ่นคนอื่นๆ	0	1	2	3	4
2. เด็กวัยรุ่นคนอื่นๆ ไม่ต้องการเป็นเพื่อนกับเขาหรือเธอ	0	1	2	3	4
3. การถูกเด็กวัยรุ่นคนอื่นๆล้อ	0	1	2	3	4
4. การไม่สามารถทำสิ่งต่างๆ ที่เด็กวัยรุ่นคนอื่นๆในวัยเดียวกับเขาหรือเธอสามารถทำได้	0	1	2	3	4
5. การทำสิ่งต่างๆให้ทันเด็กวัยรุ่นคนอื่น ๆ	0	1	2	3	4

ด้านโรงเรียน (ปัญหาเกี่ยวกับ....)	ไม่เคยเลย	เกือบไม่เคยเลย	เป็นบางครั้ง	บ่อยๆ	เกือบตลอดเวลา
1. การมีสมาธิในห้องเรียน	0	1	2	3	4
2. การลืมสิ่งต่างๆ	0	1	2	3	4
3. การตามบทเรียนให้ทัน	0	1	2	3	4
4. การขาดเรียนเพราะรู้สึกไม่สบาย	0	1	2	3	4
5. การขาดเรียนเพื่อไปหาหมอหรือไปโรงพยาบาล	0	1	2	3	4

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