**Supplementary Table 1** Cost-effectiveness league table of economic evaluations supporting the development of the National List of Essential Medicines in Thailand

| **Medicines** | **Comparator** | **Indications** | **ICER (Baht/QALY)** | **Coverage decisions** | **Year of study** |
| --- | --- | --- | --- | --- | --- |
| 1. alendronate, risedronate, raloxifene
 | vitamin D and calcium | osteoporosis | 300,000-800,000 | No | 2008[1](#_ENREF_1) |
| 1. atorvastatin\*, ﬂuvastatin or pravastatin
 | simvastatin | high risk for acute coronary syndrome | negative dominant | No | 2008[1](#_ENREF_1) |
| 1. recombinant human erythropoietin
 | blood transfusion | chemotherapy-induced anemia | negative dominant | No | 2008[1](#_ENREF_1) |
| 1. galantamine, donepezil or rivastigmine
 | palliative care | mild-to-moderate Alzheimer’s disease | 157,000-240,000 | No | 2010[1](#_ENREF_1) |
| 1. adefovir, entecavir, telbivudine and peg-interferon alpha 2a
 | lamivudine or tenofovir | treatment of chronic hepatitis B | negative dominant | No | 2011[1](#_ENREF_1) |
| 1. peg-interferon alpha 2b and ribavirin
 | treatment of cirrhosis and hepatoma | chronic hepatitis C virus infection (genotype 2, 3) | cost-saving | Yes\*\* | 2011[1](#_ENREF_1) |
| 1. peg-interferon alpha 2a and ribavirin
 | treatment of cirrhosis and hepatoma | chronic hepatitis C virus infection (genotype 2, 3) | cost-saving | Yes\*\* | 2011[1](#_ENREF_1) |
| 1. lamivudine or tenofovir
 | treatment of cirrhosis and hepatoma | chronic hepatitis B | cost-saving | Yes | 2011[1](#_ENREF_1) |
| 1. bevacizumab
 | ranibizumab | age-related macular degeneration, diabetic macular edema | cost-saving | Yes | 2012[1](#_ENREF_1) |
| 1. oxaliplatin (FOLFOX)
 | 5-ﬂuorouracil/leucovorin | advance colorectal cancer | 126,000 | Yes\*\* | 2012[1](#_ENREF_1) |
| 1. imiglucerase
 | palliative care | Gaucher disease type 1 | 6,300,000 | Yes\*\* | 2012[1](#_ENREF_1) |
| 1. intravenous immunoglobulin (IVIG)
 | intravenous steroid and immunosuppressant | dermatomyositis | cost-saving | Yes | 2013[1](#_ENREF_1) |
| 1. intravenous immunoglobulin (IVIG)
 | intravenous steroid and immunosuppressant | chronic inﬂammatory demyelinating polyneuropathy (CIDP) | 57,000 | Yes | 2013[1](#_ENREF_1) |
| 1. intravenous immunoglobulin (IVIG)
 | intravenous steroid | idiopathic thrombocytopenic purpura (ITP) | 87,000 | Yes | 2013[1](#_ENREF_1) |
| 1. dasatinib or nilotinib
 | high-dose imatinib | chronic myeloid leukemia | 92,000 | Yes\*\* | 2013[1](#_ENREF_1) |
| 1. sidenaﬁl
 | digoxin, diuretic, anticoagulant and oxygen therapy | pulmonary arterial hypertension | 168,000 | Yes\*\* | 2013[1](#_ENREF_1) |
| 1. rituximab and CHOP regimen
 | CHOP regimen (cyclophosphamide, hydroxydaunorubicin, oncovin, and prednisone) | diffused large B-cell lymphoma | 600,000 | Yes\*\* | 2013 |
| 1. bosentan or iloprost
 | digoxin, diuretic, anticoagulant and oxygen therapy | pulmonary arterial hypertension after failing sidenaﬁl | 1,023,000-4,462,000 | No | 2013[1](#_ENREF_1) |
| 1. sunitinib
 | palliative care | metastasis renal cell carcinoma | 2,400,000 | No | 2013[1](#_ENREF_1) |
| 1. rituximab
 | sequential DMARDs | rheumatoid arthritis | 1,100,000 | No | 2013[1](#_ENREF_1) |
| 1. geﬁtinib or erlotinib
 | docetaxel | second-line treatment for non-small cell lung cancer | 1,500,000-2,000,000 | No | 2013[1](#_ENREF_1) |
| 1. ustekinumab
 | palliative care | chronic plaque psoriasis | 3,500,000 | No | 2013[1](#_ENREF_1) |
| 1. sofosbuvir and peg-interferon and ribavirin
 | peg-interferon and ribavirin | chronic hepatitis C virus infection (genotype 3) | cost-saving | Yes\*\*\* | 2014 |
| 1. sofosbuvir/ledipasvir
 | peg-interferon and ribavirin | chronic hepatitis C virus infection (non-3 genotype) | cost-saving | Yes\*\*\* | 2014 |
| 1. oxaliplatin (FOLFOX or XELOX)
 | 5-fluorouracil and leucovorin  | resectable metastatic colorectal cancer | 376,310 -461,549 | No | 2015 |
| 1. darunavir/ritonavir, tenofovir, lamivudine and raltegravir
 | darunavir/ritonavir, tenofovir and lamivudine | HIV failing first-line regimen and alternative regimen treatment | 332,227 | Yes\*\* | 2016 |
| 1. prasugrel
 | clopidogrel | percutaneous coronary intervention in patients with acute coronary syndrome  | 52,000 - 123,000 | No | 2016 |
| 1. erlotinib, gefitinib or afatinib
 | platinum  | first-line treatment for EGFR mutation-positive non-small-cell lung cancer  | 1,660,782 - 2,260,863 | Underprice negotiation process  | 2017 |

\* withdraw from the NLEM as a result of health economic evaluation

\*\* inclusion in the NLEM after price negotiation

\*\*\* inclusion in the NLEM after voluntary licensing

Two case studies of using HTA for the development of the NLEM are highlighted: An economic study suggests that a sofosbuvir-based regimen is the only cost-saving intervention for treatment of chronic hepatitis c virus infection (HCV), whereas its budget impact to cover the current HCV patients in Thailand amounts to 237 million baht per year[2](#_ENREF_2). The Price Negotiation Working Group negotiated with the manufacturer for a price reduction, but the working group failed to reach an affordable price for the government. Consequently, the manufacturer proposed a voluntary license to the MOPH. This led to a decrease in budget requirement of about 118 to 285 million baht per year. As a result, sofosbuvir and the combination of sofosbuvir and ledipasvir were included in the NLEM.

Another example is the adoption of a cost-ineffective medicine, imiglucerase, which is necessary for patients who have Gaucher disease, given 2 years before undergoing curative therapy, i.e. haematopoietic stem cell transplant. Although the ICER of this medicine is ten times higher than the national cost-effectiveness threshold, it was included in the NLEM because of the low incidence of less than 10 new cases per year and, therefore, a low financial burden to the government. Additionally, the coverage decision for imiglucerase was underpinned by household financial protection against catastrophic healthcare expenditures, and this treatment provision is affordable owing to the introduction of risk sharing with managed entry agreement in the negotiation model.

**Supplementary Table 2. Assessment and appraisal results of all prioritized interventions by the SCBP during 2010-2015**

| **Prioritized interventions** | **Submitted by**  | **Methods**  | **Assessment results**  | **Appraisal results by the SCBP** |
| --- | --- | --- | --- | --- |
| **ICER**  | **Budget impact (THB million)** |
| 1. Treatment for people with chronic hepatitis B
 | Policymakers | CUA |  Cost-saving(- 14,000 THB/QALY)  | 100  | The most cost-effective intervention (Lamivudine: LMV GPO) has been covered under the benefits package (in NLEM channel)  |
| 1. Treatment for people with chronic hepatitis C
 | Academics | CUA | Cost-effective(86,660 THB/QALY) | 2,400 | Not adopted in the benefits package even though the interventions (Pegylated interferon 2a and 2b) were cost-effective because it required a high budget, and also, determining some genotypes of hepatitis B virus had a high cost and poor accuracy  |
| 1. Treatment for severe lupus nephritis
 | Patient associations | CUA  | Cost-saving(- 436,000 THB/QALY)  | 110 | The most cost-effective intervention (intravenous cyclophosphamide plus azathioprine) has been covered under the benefits package (in NLEM channel) |
| 1. Smoking cessation program
 | Academics andhealthcare industry | CUA | Cost saving (- 38,958 THB/QALY) | 1.5 | Agreed to adopt in the benefits package but requested for pilot studies to be conducted in 200 healthcare services under NHSO to develop policy recommendations prior to further consideration for adoption in the benefits package  |
| 1. Anti-IgE for severe asthma
 | Healthcare industry | CUA | Not cost-effective(414,503THB/ QALY)  | 54,000 | Not adopted in the benefits package because intervention (Omalizumab) was not cost-effective and had a high budget impact |
| 1. Implant dentures for people who have problems with complete dentures
 | Policymakers | CUA | Cost-effective(5147THB /QALY) | 150 | Not adopted in the benefits package even though the intervention was cost-effective, due to remaining problems in accessing standard treatment of dental care (complete dentures) |
| 1. Systems for screening, treatment and rehabilitation of alcoholism
 | Policymakers | Review literature and expert opinions  | N/A | N/A | Not adopted in the benefits package because some systems have been implemented so more studies were requested to review the existing policies and collaboration of NHSO with other related-organisations  |
| 1. Screening for risk factors for leukemia in people living in industrial areas
 | Academics | Cost ofillness | N/A | N/A | Not adopted in the benefits package but recommended NHSO to take a role in managing prevention and protection interventions by focusing on health promotion services at individual and family levels |
| 1. Diagnostics and treatment for multidrug-resistant tuberculosis
 | Policymakers | CBA | Cost-saving (0.76)a | 30 | Adopted in the benefits package |
| 1. Monitoring patients with sepsis by using FloTrac™, PreSep™ or PediaSat™
 | Healthcare industry | Systematic review of CUA and meta-analysis from international literature | Cost-effective(122,000 THB/ QALY) | 5,200 | Not adopted in the benefits package because of the limited information in the Thai setting, particularly in cost of treatment and suggested considering other interventions for the prevention of sepsis to reduce the cost of treatment  |
| 1. Screening for Down syndrome in the second trimester of pregnancy
 | Health professionals | CBA | Cost saving (0.81) a  | 1180 | Adopted in the benefits package and recommended the preparation of a budget and service system prior to further consideration for inclusion in P&P National Priority Program  |
| 1. Allogeneic hematopoietic stem cell transplantation for severe thalassemic patients
 | Policymakers | Quantitative Survey/In-depth interviews to determine feasibility | N/A | N/A | Adopted in the benefits package but limited only to prioritised patient groups in accordance with the current infrastructure limitations of health facilities |
| 1. Disposable absorbent products for urinary and faecal incontinence among disabled and elderly people
 | Civic groups | CUA | Cost-effective(54,000 THB /QALY) | 4,800 | Not adopted in the benefits package because of high budget impact, environmental impact, and insufficient information in prioritisation of beneficiaries |
| 1. Refractive error screening program by school teachers in pre-primary and primary Schools
 | Policymakers | Survey/Focus group to determine feasibility  | N/A | N/A | Agreed to adopt in the benefits package but requested for an increase of pilot studies from four to ten provinces before making final decision |
| 1. Laparoscopic Surgery
 | Healthcare industry | Cost analysis /budget impact | N/A | 66 | Adopted in the benefits package |
| 1. Treatment for patients with chronic Myeloid Leukemia Refractory
 | Healthcare industry | CUA | Cost-saving for Dasatinib (-749,757 THB /QALY) and cost-effective for Nilotinib (86,698 THB /QALY)  | 5,048 | Adopted in the benefits package (in NLEM channel) |
| 1. Video- Electroencephalography monitoring and magnetic resonance imaging for pre-surgical evaluation in adult patients with intractable focal epilepsy
 | Policymakers | 122 | Cost-effective(84,752-98,456 THB /QALY) | 122 | Adopted in the benefits package |
| 1. HLA-B\*15:02 screening for carbamazepine-induced severe adverse drug reactions
 | Policy-makers | CUA | Cost-effective for patients with neuropathic pain (130,000 THB/ QALY);Not cost-effective for epilepsy patients(222,000THB/ QALY)  | 1,231 | Agreed to adopt for both groups of patients in the benefits package due to ethical issues but requested for the Clinical Practice Guidelines to be developed before presenting to NHSO for budget consideration  |
| 1. Pressure mattress for preventing pressure ulcers in severe disability and prolonged immobilized patients
 | Civic group | Survey | N/A | N/A | Disagreed to adopt in the benefits package because the effectiveness of the intervention based on a survey was weak  |
| 1. Self-monitoring blood glucose in diabetes mellitus type 1 and 2
 | Patient associations | CUA | Cost-effective for DM type 1(118,054-119,755 THB/QALY);Not cost-effective for DM type 2  | 2,600 | Agreed to adopt in the benefits package, but limited to patients with DM type 1 and requested for an appropriate implementation plan to be developed |
| 1. AUDIT- or ASSIST screening and linked brief intervention
 | Policymakers | CEA | Cost-saving   | 5 in 5-12 provinces  | Adopted in the benefits package |
| 1. Referral transport system for end of life patients
 | Civic group | Survey/ Budget impact | N/A | 35 | Adopted in the benefits package and recommended for inclusion in the Palliative Care package |
| 1. Hemodialysis service in community hospital
 | Civic group | N/A | Not cost-effective  | None  | Adopted in the benefits package even though the intervention was not cost-effective because it can prevent catastrophic health expenditure of households with no budget impact  |
| 1. Surgical navigation
 | Healthcare industry | Cost analysis/Feasibility  | N/A | N/A | Disagreed to adopt in the benefits package because there was a lack of guidelines or indication supporting the use of surgical navigation in Thailand  |
| 1. Diagnostic strategies to prevent the birth of disabled children in couples with a child with previous structural chromosome abnormality
 | Policymakers | CBA | Cost-effective(1.41-1.72) a | 9-14 | Adopted in the benefits package |
| 1. Colorectal cancer screening
 | Policymakers | CUA | Cost-effective(18,300 THB/QALY) | 200 | Adopted in the benefits package |

aCost-Benefit Ratio

In 2010-2015, USD 1 is approximately THB 30-33

High budget impact >200 million Thai baht per annum; low budget impact ≤200 million Thai baht per annum

**Note:** The SCBP: the Subcommittee for the Development of the Benefit package and Service Delivery; ICER: The incremental cost-effectiveness ratio; NHSO: National Health Security Office; NLEM: National List of Essential Medicine; CUA: Cost-Utility Analysis; CBA: Cost-Benefit Analysis; QALY: Quality-Adjusted Life Year; THB: Thai Baht.

The SCBP did not approve supporting disposable absorbent products for the disabled and elderly. Even though the intervention was cost-effective, it resulted in a very high budget impact: 4,800 million baht. Implant dentures for people with problems with complete dentures was cost-effective with low budget impact; however, it was not included in the package. This was to avoid inequality within the health system because limited accessibility to complete dentures for some beneficiaries was evident. Furthermore, HLA-B\*15:02 screening for epilepsy patients before receiving carbamazepine therapy was not cost-effective with high budget impact. Yet, it was recommended for inclusion in the package due to social and ethical issues. Without such screening, people with HLA-B\*15:02 have an increased risk of mortality from Stevens–Johnson syndrome and toxic epidermal necrosis.