THE KOREAN INDIVIDUAL-MICROSIMULATION MODEL FOR CARDIOVASCULAR HEALTH INTERVENTIONS (KIMCHI)

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OBJECTIVES: To develop an epidemiological and economic model of first-onset cardiovascular disease (CVD, comprising myocardial infarction and ischemic stroke) in Korea that can be applied to cost-effectiveness analyses of interventions.

METHODS: KIMCHI is a Markov model with yearly cycles and the health states ‘Alive without CVD’, ‘Alive with CVD’, ‘Dead from CVD’ and ‘Dead from non-CVD causes’. It is populated with 3270 CVD-naïve subjects aged ≥18 years from the 2005 Korea National Health and Nutritional Examination Survey. Annual probabilities of CVD are estimated for each individual using the Asian-specific risk equation by Wu, the covariates for which are: sex, age, total cholesterol (TC), systolic blood pressure (SBP), smoking, diabetes and body mass index (BMI). Age- and sex-specific annual probabilities of death are based on national health data. To illustrate the function of KIMCHI, follow-up was simulated of Koreans aged ≥55 years until death or age 99 and the cost-effectiveness of atorvastatin for the primary prevention of CVD assessed using decision analysis. The TC-reducing efficacy and cost of atorvastatin were drawn from a meta-analysis and current drug pricing schedules, respectively.

CVD costs were provided by the Korean Health Insurance Review and Assessment Services. A 5% annual discount rate was applied. RESULTS: KIMCHI predicted that 30.4% and 18.2% of CVD-naïve Koreans currently aged ≥55 years will develop non-fatal and fatal CVD, respectively, by age 99 and the cost-effectiveness of atorvastatin for the primary prevention of CVD assessed using decision analysis. The TC-reducing efficacy and cost of atorvastatin were drawn from a meta-analysis and current drug pricing schedules, respectively. CVD costs were provided by the Korean Health Insurance Review and Assessment Services. A 5% annual discount rate was applied. RESULTS: KIMCHI predicted that 30.4% and 18.2% of CVD-naïve Koreans currently aged ≥55 years will develop non-fatal and fatal CVD, respectively, by age 99. Atorvastatin was predicted to reduce these figures to 25.4% and 15.4%, corresponding to numbers needed to treat of 20 and 36 to prevent non-fatal and fatal CVD, respectively. The estimated ICERs were 21.8 million KW/YoLS and 17.4 million KW/QAL Y saved. CONCLUSIONS: KIMCHI is a contemporary epidemiological and economic model of CVD in Korea that can predict future patterns of disease and be applied to cost-effectiveness analyses of interventions that alter any of TC, SBP, smoking, diabetes and BMI.

COST EFFECTIVENESS OF HIGH DOSE ATORVASTATIN IN ACUTE CORONARY SYNDROME PATIENTS IN THE UK

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OBJECTIVES: To estimate the long- and short-term costs and effects of 2 year treatment with high-dose atorvastatin (80 mg) versus medium dose simvastatin (40 mg) in patients with acute coronary syndrome (ACS) and to analyse risk levels where therapy may be expected to be cost-effective. METHODS: Efficacy is estimated based on a preliminary Bayesian meta-analysis linking decrease in LDL cholesterol levels to decreases in secondary cardiac events (MI, stroke, cardiovascular death) drawing data from the A to Z and PROVE-IT trials and using priors from other statin trials. The Markov model combines estimates of the occurrence of future events; UK cost data; and quality of life. A baseline risk of 12% is taken from the CURE trial, an ACS study with risks that lie between those in the international ACS registry (GRACE) and those of the two statin trials. RESULTS: At a 12% event risk during the first 6 months and a 4% risk during later months, and with an estimated 10% additional efficacy of high-dose atorvastatin, the estimated NNT to avoid one event is approximately 30. Costs per life year gained and costs per QALY are estimated at below £10,000. Costs per QALY are anticipated to be over £30,000 when the 6-month risk of cardiac events is less than 1% (corresponding with a 10-year risk of >20%), or when the estimated additional risk reduction due to high-dose atorvastatin is less than 3%. CONCLUSIONS: Based on our preliminary findings, high-dose atorvastatin is estimated to be cost-effective in comparison to medium dose simvastatin in ACS patients. As the analysis presented here is preliminary, the results may alter following reconsideration of the priors. In addition, subsequent probabilistic analysis will be used to explore uncertainties around the estimates.

ANEURYSM OCCLUSION IN ELDERLY PATIENTS WITH ANEURYSMAL SUBARACHNOID HAEMORRHAGE: A COST-UTILITY ANALYSIS

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OBJECTIVES: To determine the balance between risks and benefits of aneurysm occlusion in elderly patients with subarachnoid haemorrhage (SAH), as function of patient characteristics and aneurysm characteristics. The analysis focused mainly on the effects of patient age, clinical condition and day of admission after SAH. METHODS: With Markov model Monte Carlo simulation we evaluated health gains, in quality-adjusted life years (QALY), additional costs, and incremental cost-effectiveness ratios (ICER) of aneurysm occlusion in 192 subgroups of patients. Subgroups were defined by age (70–74, 75–79, 80–84, 85+ years), neurological condition at admission (poor or good), day of admission after SAH (<4, 4–10, 11–21 days), gender, aneurysm size (<10 mm or ≥10 mm) and aneurysm location (anterior or posterior circulation). RESULTS: In patients admitted in poor condition ≥10 days after SAH, and patients older than 80 years, admitted in poor condition ≥4 days after SAH, aneurysm occlusion implied QALY loss as well as increased costs, regardless of aneurysm size and location. The ICER of occlusion was better than €50,000/QALY only in women aged 70–79 years, and men aged 70–74 years, admitted in good condition in ≤4 days. Occlusion was both beneficial and cost-saving in women aged 70–74 years, admitted in good condition in ≤4 days, with a small posterior aneurysm. CONCLUSIONS: Occlusion of ruptured intracranal aneurysms instead of conservative treatment improves outcome in some elderly patients, but not in all, and will often incur unacceptably high costs. The occlusion benefits of reduced risks of rebleeding and recurrent SAH only ensure the final balance is positive when patients can profit from them, in fair health, over several years. Thus, beyond some patient age, occlusion should no longer be viewed as standard treatment, but as option, viable only in patients with a prolonged life expectancy.

ECONOMIC EVALUATION OF IRBESARTAN IN GREECE

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OBJECTIVES: Hypertension is a major risk factor for cardiovascular disease and a leading cause of morbidity and mortality. The present study evaluates irbesartan in relation to losartan and valsartan in the treatment of hypertension in Greece. METHODS: A Markov model was constructed with eight health states, including: hypertension, myocardial infarction, post-MI,
angina, stroke, post-stroke, heart failure and death. It has an annual cycle and estimates mean quality-adjusted survival and treatment cost, which reflects hypertension treatment and the management of cardiovascular events. Risk functions were used to conduct extrapolations. Data on treatment effectiveness, quality-of-life and epidemiology were obtained from published clinical trials and studies. The database of the main insurance fund (IKA) was analysed to estimate the cost of events. The analysis was done from a payer perspective, all outcomes were discounted at 3% and prices correspond to 2008. RESULTS: The estimated patient cost per annum for each health state was: stable angina: €2252; unstable angina: €2572; myocardial infarction: €2473; post-MI: €1677; stroke: €12,233; post-stroke: €1240; heart failure: €2655; angiogram: €1544; angioplasty: €6511; bypass surgery: €11,514. For the baseline group (age: 57 years, systolic-blood-pressure: 147, cholesterol: 6.00 mmol/L, BMI: 29 kg/m²) with mild/moderate disease, the total cost was €15,146 with irbesartan, €15,486 with losartan and €15,613 valsartan; QALYs were 12.67, 12.63 and 12.64, respectively. For the group with severe disease, the total cost with irbesartan) was €15,798 (150 mg) and €18,697 (300 mg), whilst with Losartan was €16,295 (50 mg) and €22,496 (100 mg); QALYs were 12.47 and 12.37 for irbesartan and losartan respectively. Thus, irbesartan was less costly and more effective and dominated the other two treatments. Similar results were obtained in relation to various other patient groups and several sensitivity analyses. CONCLUSIONS: Different patient populations, irbesartan represents good value for money in the Greek NHS setting, compared to selected commonly used alternatives.

AN ECONOMIC EVALUATION OF THE ADDITION OF FIXED-DOSE NIACIN EXTENDED-RELEASE AND SIMVASTATIN THERAPY TO THE MANAGED CARE FORMULARY IN TERMS OF OPTIMAL LIPID VALUE ATTAINMENT

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OBJECTIVES: To model the impact of the addition of fixed-dose niacin extended-release and simvastatin (NER/S) therapy to a health plan formulary in terms of optimal low density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C), and triglycerides (TG) value attainment. METHODS: Two hypothetical formularies with all major branded and generic lipid drugs were modeled over a three year time horizon: a formulary not including NER/S (current formulary) and a formulary which did (revised formulary). Primary and secondary risk patients with ≥1 sub-optimal lipid parameter were sampled from the HealthCore Integrated Research Database between 1/1/2000 and 2/28/2005. Package insert efficacy of antihyperlipidemic medications in each formulary was applied to the sample population. Post-treatment lipid values were evaluated according to U.S. lipid guidelines. Rates of individual and combined optimal lipid value (OLV) [LDL-C, HDL-C, and TG] achievement were estimated in direct proportion to lipid therapy market shares in both formularies. Changes in clinical outcomes between formularies were evaluated relative to incremental change in pharmacy and cardiovascular (CV) disease related medical costs. Market penetration of NER/S was assumed to be 1.5% and payer discounts of 17% and 50% were applied to branded and generic wholesale acquisition costs. RESULTS: The rate of combined OLV attainment over three years in the revised formulary increased 0.57% from the current formulary. Attainment of optimal LDL-C, HDL-C and TG values increased by 0.07%, 0.30%, and 0.10%, respectively. The cost for a 1% increase in optimal LDL-C, HDL-C, and TG attainment was $3103, $952, and $2047 respectively. There was an estimated $1147 cost for every 1% increase in combined OLV attainment. CONCLUSIONS: The addition of NER/S to the health plan formulary increases individual and combined OLV achievement thereby having the potential to reduce the incidence of CV events and CV-related medical costs.

TISSUE ENGINEERING OF VALVED VENOUS CONDUITS (VVC) VERSUS CONSERVATIVE THERAPY IN PATIENTS WITH CHRONIC VENOUS INSUFFICIENCY (CVI). A DECISION ANALYTIC MODEL USING EXPERT ESTIMATED UTILITIES BASED ON DERIVED DATA FROM ANIMAL STUDIES AS A PRE-MARKETING TECHNOLOGY ASSESSMENT APPROACH WITH GERMAN DATA

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OBJECTIVES: The development of a decision model for the assessment of the emerging technology implantation of valved venous conduits (VVC) using tissue engineering in patients with chronic venous insufficiency (CVI) versus Conservative treatment options like horse chestnut seed extract and compression therapy. METHODS: The model allows to enter parameters for the efficacy, safety, long-term effectiveness, quality of life, disease-specific mortality, and costs and to derive (quality-adjusted) life expectancy and cost-effectiveness from a health care system perspective. It evaluates a lifelong time horizon using the Gompertz function and applies an annual discount rate of 3%. Cost and epidemiological data of CVI were gathered from literature. The costs for VVC were estimated considering the development costs. Finally to calculate QALYs we surveyed a panel of angiologists and angiographers presenting the results of animal studies concerning the functionality, tolerability and hemorheology. RESULTS: A marginal difference of 0.04 LY in favor of VVC was calculated incorporating the lethality of the implantation. VVC yielded additional QALY gains of 2.02 compared to conservative therapy. Patient implanted with VVC were estimated to reach a utility of 0.64 compared with 0.50 for those receiving conservative therapy. VVC was in the conservative scenario with implantation of up to four conduits €4395 more expensive; in the scenario with up to two implanted conduits the difference was only €330. VVC seems to be cost-effective for CVI patients, with an incremental cost-effectiveness ratio compared with conservative therapy of 163 to €2176/QALY. CONCLUSIONS: Especially in the field of emerging technologies, where data from clinical trials are lacking, decision-analytic modeling even in a pre-market condition is a useful tool to systematically assess the expected value of technologies and the related uncertainty. Thereby, developers can avoid misdirected investment in health care systems ruled by thresholds even before the diffusion of a technology.

CHANGE IN LIPID VALUES, TARGET LIPID VALUE ATTAINMENT, AND ANNUAL HEALTH CARE RESOURCE UTILIZATION AND COSTS AMONG PATIENTS INITIATING COMBINATION STATIN AND EXTENDED-RELEASE NIACIN THERAPY

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OBJECTIVES: To evaluate changes in low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-