reimbursement decisions. Our objective was to evaluate the lag between a drug's FDA approval and the publication of the first published CUA evaluating the product. **METHODS:** We used the FDA's website to identify newly-approved drugs from 2000-2010 (n=342). For each drug, we searched the Tufts Medical Center Cost-Effectiveness Analysis Registry and the NHS Economic Evaluation Database for CUAs evaluating the drug for the corresponding FDA-approved indication. We included drugs with a corresponding CUA in our dataset. When multiple CUAs for a drug were available, we included the CUA with the earliest publication date. We used multivariate regression to determine factors associated with time to CUA publication (years). Independent variables included drug approval year, study funder, i.e., whether the CUA was supported by industry, and whether the FDA assigned the drug priority review status. **RESULTS:** One hundred and fifty-six (45.6%) drugs in our sample had a corresponding CUA. Average time to CUA publication was 4 years (standard deviation 2.3 years). We divided drug approvals into three time intervals; 2000-2002 (mean time to CUA publication=5.3; SD=2.4), 2003-2006 (mean=3.9; SD=2.1) and 2007-2010 (mean=2.4; SD=0.97). We found that compared to CUAs for drugs approved from 2000-2002, time to CUA publication was 1.5 years shorter for drugs approved from 2003-2006 ($p<0.001$) and 3 years shorter for drugs approved from 2007-2010 ($p<0.0001$). Source of study support and FDA priority review status were not significantly associated with time to publication **CONCLUSIONS:** For FDA-approved drugs with a corresponding CUA, we found a substantial time lag between FDA approval and CUA publication, suggesting that decision-makers are making important drug coverage and reimbursement decisions without published cost-effectiveness evidence available. However, the time to CUA publication appears to have declined over time.

PHP12

THE TREND OF PRICE LEVEL FOR ANTI-INFECTIVE DRUGS IN CHINA: AN EMPIRICAL STUDY BASED ON MULTIPLE INDEX METHODS

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OBJECTIVES: To measure the trend of price level for anti-infective drugs in Tianjin, China from 2006 to 2010 using multiple index methods and to explore measurement bias induced by index methods and measurement units. **METHODS:** Data were extracted from inpatient claims in Tianjin Urban Employee Basic Medical Insurance database from 2006 to 2010. Laspeyres, Paasches, Fisher and chained Fisher index methods were employed to measure the price level. Price indices were calculated both at molecule level (defined by active ingredient) and product level (defined by molecule, strength, preparation and manufacturer). Units of quantity and price were defined as per DDD (Defined Daily Dose), per milligram of active ingredient, and per minimum unit separately to calculate the indices. **RESULTS:** At product level, 367 constantly used products (26% of total 1422 products) were included in unchained indices and 1041 products (73% of total products) were included in chained Fisher indices. The results of multiple indices consistently indicated that the price level decreased and the decreasing range indicated by different index methods were from 16% (Laspeyres-unit index at molecule level) to 27% (Laspeyres-DDD index at product level). The price indices at molecule level decreased slower than the counterparts at product level (22% vs. 25% in chained Fisher-DDD index). At molecule level, price indices based on per DDD decreased faster than per mg and per unit (22%, 21% and 18% in chained Fisher). Laspeyres indices decreased slower than Paasches at molecule level while the contrary was the case at product level. The results from chained Fisher and unchained counterparts were similar (25% vs. 26% at product level). **CONCLUSIONS:** The price level of anti-infective drugs decreased heavily in Tianjin, China. The chained indices were similar to the unchained counterparts which suggested that the price of newer and older products decreased at similar rate.

PHP13

PERFORMANCE EVALUATION OF THE ESSENTIAL MEDICINES SYSTEM IN CHINA BASED ON DATA ENVELOPMENT ANALYSIS: A CASE STUDY IN SICHUAN PROVINCE

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OBJECTIVES: To establish performance evaluation model of the Essential Medicine System in China based on Data Envelopment Analysis(DEA), evaluate the relative efficiency of essential medicines system and analysis the main problem and impact factors on it. **METHODS:** 15 counties in Sichuan province were selected by stratified sampling as Decision Making Units(DMUs); for each county, 30% primary health care facilities, totally 284 facilities were involved as sample. Questionnaire survey was conducted to collect data of input and output indicators in 2010 and 2011 from sample facilities. 3 input indicators and 4 output indicators were set based on literature review, WHO's National Drug Policies Monitoring Indicators and experiential principle of DEA. Excel 2007 was used to encode data, DEAP 2.1 software was used to conduct CRS - CCR and VRS - BCC Data Envelopment Analysis, SPSS16.0 was used to conduct T-test and multiple linear regression analysis to exam the statistic difference between 2010 and 2011, and the influencing factors of efficiency. **RESULTS:** For input indicators, the average special funds of Essential Medicine System(x1) in 15 counties was raised from 0.52 million US$ in 2010 to 0.69 million US$ in 2011 the average number of essential medicines(x2) and drug delivery companies(x3) raised as well. For output indicators, average outpatient cost per visit(y1) and inpatient cost per admission(y2) decreased, while the outpatient visit times(y3) and discharge numbers(y4) kept no increasing as expected. The overall efficiency of Essential Medicines System in Sichuan province in two years were in relatively high level(0.908 in 2010 and 0.832 in 2011). Analysis on technical efficiency, scale efficiency, and return to scale showed the main existing problem was insufficient utilization of input health care resource. **CONCLUSIONS:** The effectiveness of implementation of Nation Essential Medicine System has been displayed, but health care resources should be adjusted and utilized rationally to improve the overall efficiency.

PHP14

DIVERGENT EVIDENCE REQUIREMENTS COMPARING THE AUTHORIZATION AND REIMBURSEMENT PROCESSES OF HIGH-RISK MEDICAL DEVICES – THE EUROPEAN SITUATION

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OBJECTIVES: In the last decade awareness has been raised due to unsafe and dangerous devices entering the European market, putting patient safety at stake. Consequently, evidence requirements may not be enough to ensure a high-quality and safe provision of medical devices in Europe.This research aims at exploring the authorization and reimbursement processes and the associated evidence requirements comparing four high-impact regions Europe, United States, Australia and Canada. **METHODS:** First, we performed a literature search about the authorization and reimbursement in the four high-impact regions. Second, seven high-risk medical devices were chosen as examples and current authorization and reimbursement status were assessed. Information was extracted from publicly available summaries, from PubMed, and from the clinical trial database (clincialtrial.gov), supplemented by the worldwideweb. **RESULTS:** The evidence required for the authorization and reimbursement processes clearly differs in the four high-impact regions. All seven devices have been authorized in Europe, three in Australia, one in the United States, and one in Canada. Currently none of the seven devices is recommended for reimbursement in the four high-impact regions. **CONCLUSIONS:** Looking at the difference in evidence requirements, more harmonization, transparency and specific regulations are needed worldwide for the authorization and reimbursement of high-risk medical devices to ensure a high-quality and safe provision.

PHP15

OVERVIEW OF EXTERNAL REFERENCE PRICING SYSTEMS IN EUROPE

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OBJECTIVES: External reference pricing (ERP) is one of most common cost-containment tools used to reduce prices for in-patent pharmaceuticals in the European Union Member States (MS). The objective of this project was to provide an overview of ERP systems, both on processes and potential issues related to ERP systems in 31 European countries (28 EU MS, Iceland, Norway and Switzerland) (performed for the EU Commission). **METHODS:** A systematic structured literature review and consultation of representatives of competent authorities and international organizations were conducted to identify and characterize the use of ERP, to describe its impacts on the prices of pharmaceuticals and to discuss possible cross-country coordination issues in EU MS. **RESULTS:** All selected countries apply ERP except the UK and Sweden and 23 countries use ERP as main systematic criterion. ERP is based on legislated pricing rules with different levels of accuracy in the majority of European countries using ERP. ERP is applied either to all marketed drugs or to specific categories of medicines, mainly used for publicly reimbursed medicines. The number of reference countries included in the basket varies from 1 to 31. There is a great variation in calculation methods used to compute the price; 15 countries use average price, 7 countries use the lowest price, and 7 countries use other calculation methods. Among reported limitations of ERP application are reliable sources of price information, price heterogeneity, exchange rate volatility, and hidden discounts. Spill-over effects on other countries and downward price convergence have often been argued leading to pricing strategies from pharmaceutical companies. **CONCLUSIONS:** While ERP is widely used in Europe, processes and available price information vary from one country to another that may limit ERP application. Moreover, ERP spill-over effect is a major concern of pharmaceutical firms leading to implementation of the so-called "launch sequence strategies".

PHP16

THE ANALYSIS OF THE DRUG REIMBURSEMENT DECISIONS BEFORE AND AFTER THE POSITIVE LIST SYSTEM IN SOUTH KOREA

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OBJECTIVES: In Korea, the positive list system (PLS) was introduced in 2007 to ensure the good value for money in pharmaceutical expenditure. This study aims to investigate factors that are most influential in reimbursement decisions under the PLS. **METHODS:** To assess the 5 years operations and compare the results before and after the PLS, we analyzed the drug prices submitted from the companies, the reimbursement decisions made by Pharmaceutical Benefit Coverage Assessment Committee (PBCAC). We extracted data from published evaluation reports, PBCAC meeting minutes, and internal documents of Health Insurance Review and Assessment Service. **RESULTS:** Under the PLS, 71% of submitted drugs were recommended for reimbursement during January 2007- April 2012. For submissions demonstrated superiority or non-inferiority in clinical benefit, 79% of submissions were decided to be reimbursed. However, submissions with inferiority or uncertainties in clinical benefit were rejected regardless of the price. Comparing the negotiated price under the PLS to the relative price under the negative system, the negotiated price was 85% of the relative price. The probability of recommendation was high when ICER was under the GDP per capita, nevertheless submissions with high uncertainty in cost-effectiveness were rejected. Submissions which had low uncertainty and products for severe diseases or rare diseases were recommended for reimbursement despite ICER was high. **CONCLUSIONS:** This study confirmed clinical benefit was the main driver of the reimbursement decision making. Not only clinical benefit and cost-effectiveness but the disease severity, the uncertainty of evidence and reimbursement in other countries were also considered in the reimbursement decision making process. In addition, the drug prices were reduced a little after PLS introduced compared to those under the negative list system.

PHP17

ECONOMIC EVALUATION: A CHALLENGE IN INCORPORATING NEW HEALTH TECHNOLOGIES TO THE BRAZILIAN PUBLIC HEALTH SYSTEM (SUS)

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OBJECTIVES: To reveal the main causes of non-compliance for technology incorporation requests into the Brazilian Public Health System (SUS) for the period of 2012 and 2013. **METHODS:** This was a descriptive cross-sectional study. The analysis was performed using the database of National Committee for Technology Incorporation (CONITEC) submitted applications for incorporation in the years 2012 and 2013. The CONITEC, which belongs to the Ministry of Health of Brazil, is responsible for the incorporation, exclusion or alteration of new medicines, procedures and products on the public health system. The presentation of economic evaluation by applicants (economic study and a budget impact analysis) is necessary to enable the analysis of the proposed requirements. **RESULTS:** Out of the 142 external (outside the Ministry of Health) requests submitted for analysis, 56 (39%) were non-compliant, 50 (89%) of them were due to problems in the economic evaluation. Out of the economically non-compliant, 16 (32%) presented problems in the economic study only and 32 (64%) of them presented problems in both items. The main problems observed were not submitting an economic study, not submitting the economic model used in the study, and presenting an economic study using a different perspective than the one of SUS. **CONCLUSIONS:** The high percentage of non-compliance due to the economic evaluation points out the difficulty faced in completing these studies. It is important to invest in initiatives, human resources, training and spreading of economic evaluation knowledge which enables clarifying the required criteria for applying for an incorporation request.

PHP19

PROGRESS IN PERSONALIZED MEDICINE IS SLOWER THAN SOME HAD EXPECTED, PARTLY BECAUSE OF THE SCIENCE AND PARTLY BECAUSE OF INSUFFICIENT ECONOMIC INCENTIVES, PARTICULARLY FOR INVESTING IN MOLECULAR DIAGNOSTICS (MDX)

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OBJECTIVES: Ten years after completion of the Human Genome Project, progress towards making personalized medicine a reality has been slower than expected. This paper seeks to identify how evidence has been generated by critically evaluating successful MDx case studies, and, to the extent possible, identify any lessons from them. **METHODS:** A literature review identified nine examples of success where diagnostic tests are bringing personalized medicine into clinical practice with positive health and economic impact for patients, health care systems, and manufacturers. **RESULTS:** Each case demonstrates that a companion MDx can provide information to patients and health care providers; allow for a targeting of treatments or other interventions to a subset of the population despite differences in whether they are prognostic, predictive, or used for monitoring; offer the potential for the health system to deliver more health gain. **CONCLUSIONS:** There is a diversity of approaches in developing MDx and the range of challenges posed both by the science and in acceptance and use. Moreover, because of the great potential value of personalized medicine for patients and health systems alike, there is a compelling rationale that both payers and the public sector should help fund research on the clinical effectiveness of MDx.

PHP20

ASSESSMENT OF PHARMACEUTICAL PRODUCTS APPROVED BY THE UNITED STATES FDA AND REGISTERED IN PERU

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OBJECTIVES: In spite of the globalization of the pharmaceutical industry, differences exist in the number and characteristics of the pharmaceutical products available in each country. This study compared the pharmaceutical products approved in the US and registered in Peru as of December, 2013, and assessed differences in approvals of chemical entities, therapeutic biologics and orphan drugs, and generic entry. **METHODS:** Information about pharmaceutical products approved in the US and Peru was obtained from the US Food and Drug Administration (FDA), and the General Directory of Medicines, Supplies, and Drugs of Peru (DIGEMID), respectively. Descriptive statistics and chi-square tests were performed in the analysis. Significant level was set at 0.05. **RESULTS:** A total of 2,409 approved pharmaceutical products were listed by the FDA as of December, 2013 of which 763 (31.7%) were also registered by DIGEMID, including 39.1% of generic multisource products and 25.1% of brand single source products. A total of 112 biologic products were listed by the FDA and 64 (57.1%) were also registered in Peru. There were 368 products with orphan indications approved by the FDA and 112 (30.4%) were also registered in Peru. Generic competition was available for 46.8% of the products approved by the FDA and 57.8% of the products approved by DIGEMID ($p<0.001$). **CONCLUSIONS:** Peru has substantially less pharmaceutical products approved than the US, especially for brand products without generic competition and orphan drugs. The highest percentage of products approved in both countries corresponded to therapeutic biologics. Part of the differences in drug approvals can be explained by variations in the epidemiological profile of both countries. The relatively small size of the Peruvian pharmaceutical market and limited purchasing power may result in reduced incentives for pharmaceutical companies to register new molecular entities and products for orphan diseases in Peru.

PHP22

EVALUATING CRITICISM OF THE FDA ACCELERATED APPROVAL PATHWAY - EMA EVALUATION OF DRUGS THAT HAVE BEEN WITHDRAWN FOLLOWING ACCELERATED APPROVAL BY THE FDA

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OBJECTIVES: Since 1992, the Food and Drugs Administration (FDA) accelerated approval pathway has enabled market entry of drugs for serious conditions based on a surrogate endpoint that is likely to predict clinical benefit with confirmatory trials to be completed post-approval. However, five drugs have since been withdrawn or severely restricted following accelerated approval due to lack of efficacy (bevacizumab, [indication: breast cancer; withdrawn 2011; approved 2009], amifostine [indication: renal toxicity; withdrawn: 2006; approved: 1996], gefitinib [withdrawn: 2005; approved: 2003), safety concerns (gemtuzumab, withdrawn 2010; approved 2000), or lack of confirmatory trial data (celecoxib, indication: Familial Adenop Polymatosis [FAP], withdrawn: 2011, approved 1999), leading to criticisms that this pathway allows drugs to enter the market prior to their efficacy and safety being adequately demonstrated. This research aims to evaluate these criticisms by comparing how the drugs were assessed by the European Medicines Agency (EMA). **METHODS:** EMA and FDA evaluations of these drugs were sourced; the approval decision, date, and rationale were compared, alongside any post-approval restrictions/withdrawals. **RESULTS:** EMA appraisal information was publically available for bevacizumab, gefitinib, gemtuzumab, and celecoxib. Gemtuzumab (EMA refused, 2008) and gefitinib (EMA submission withdrawn 2005 after failing Phase III trial) were not granted EMA licences in the FDA-approved indications. In contrast, bevacizumab (2007) and celecoxib (2003) were EMA-approved with the same data package used to gain approval by the FDA. In 2011, celecoxib was withdrawn for FAP in both Europe and US due to lack of confirmatory trial data. However, bevacizumab was EMA approved a year earlier than the FDA and has not been withdrawn by the EMA in this indication. **CONCLUSIONS:** FDA accelerated approval pathway criticism due to post-approval drug withdrawals may be overstated, as the EMA approved two of the five drugs subsequently withdrawn by the FDA, one of which the EMA has not withdrawn.

PHP23

ESTIMATION OF CHANGE IN PRESCRIPTION DRUG EXPENDITURES ON THE REFERENCE PRICING SYSTEM IN SOUTH KOREA

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OBJECTIVES: A reference pricing system is a policy strategy that sets a reimbursement level or reference price for a group of therapeutically interchangeable drugs, i.e. the reference group. A patient is responsible for any difference between the reference price and the price of a more costly drug. The purpose of this study was to estimate future prescription drug expenditures after implementation of the reference pricing system in South Korea. **METHODS:** Korean national health insurance data collected for January, April, July, and October in 2011 were obtained from the Health Insurance Review and Assessment Service. All medications were included to estimate drug expenditures, except patented drugs and orphan drugs. A reference group was defined as the category including drugs with same ingredient or same therapeutic class. Possible scenarios after the introduction of the reference pricing system, such as a copay deduction program for only drugs below the reference price by the government, price lowering by companies and changes in prescribing patterns, were included in the model. **RESULTS:** A base-line copay rate of 20.4% was calculated. When a reference price was set at the average price of drugs in the reference group, patient co-payment rates were estimated to increase to 23.9%. However, when we assumed that companies reduce the price by 5% and prescribers changed 10% of prescriptions to avoid patients paying additional co-payments, co-payment rates were estimated to be 22.9%. In addition, the copay deduction could help decrease co-payment rates to 19.6%. **CONCLUSIONS:** Reference pricing system can contribute to a reduction in prescription medication expenditures for third-party payers. The co-payment for patients could be increased by moving additional financial burden from the insurer to patients. However, an increase in co-payment rates could be limited and total drug expenditures could be reduced by copay discounts, medication price reductions or prescribing changes.

PHP24

PHARMACEUTICAL COMPANIES PRICING STRATEGIES AFTER GENERIC ENTRY INTO THE NEW ZEALAND MARKET

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OBJECTIVES: This study evaluates pharmaceutical companies pricing strategies after generic entry into the New Zealand market in the period 2007-2012, and its effects on drug utilization and expenditures. **METHODS:** Market data derived from IMSHealth. Data include active ingredient, route, dosage form, strength, brand/generic status, prescription drug (Rx)/over-the-counter status, date of market entry, ex-manufacturer standard unit sales, and ex-manufacturer NZ dollars sales. NZ$ were adjusted to 2012 using the NZ consumer price index. Study sample includes the 37 products of the top 125 products by sales in the period 2007-2012 that experienced generic entry during the study period. **RESULTS:** Sales of products in the top 125 by sales amounted NZ$3.1 billion; 46.6% of the overall NZ market. Brands accounted for 95.8% of the expenditures. The average ex-manufacturer price per standard unit was NZ$55.9 (95%CI: NZ$43.8-67.9) for Rx, and NZ$ 685.8 for therapeutic biologics (95%CI: NZ$482.3-889.2). The median price at generic entry date was 27.4% of the median brand price. The median price at generic entry date of study sample was NS$1.18 per unit for brands and NS$0.32 for generics. In 2012, the median price per unit was down to NZ$0.83 and NZ$0.22 for brands and generics, respectively. Standard unit sales increased on average 14% (95% CI 7%-21%) after first year of generic entry. Several brand products (clopidogrel, letrozole, omeprazole, pantoprazole) were discontinued after generic entry. **CONCLUSIONS:** Generic entry resulted in an average 30% reduction in the average drug price. Brand companies either reduced the brand price to match generic prices, or maintained the brand price at levels immediately before generic market entry. The first strategy resulted in the brand keeping large