some authorities, such as value-of-information analyses and scenario analyses for structural assumptions.

Hospital and Clinical Practice Studies

HP1
VALIDATED MODELS FOR PRE-TEST PROBABILITY OF STABLE CORONARY ARTERY DISEASE: A SYSTEMATIC REVIEW SUGGESTING HOW TO IMPROVE VALIDATION PROCEDURES

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Objectives: An overuse of invasive and non-invasive anatomical testing for the diagnosis of coronary artery disease (CAD) affects patients' and healthcare professionals' safety, and the sustainability of Healthcare Systems. Pre-test probability (PTP) models can be routinely used as gatekeeper for initial patient management. Several PTP models have been developed after the seminal work of Diamond and Forrester in the late 1970s, however to assess their generalizability to different populations extended validation procedures should be carried out and their results carefully analyzed. ***Methods:*** A systematic review has been carried out to assess the discrimination capabilities of PTP models validated on external populations. The main metric was the area under the ROC curve (AUC). A comprehensive search has been done in MEDLINE®, HealthSTAR, and Global Health databases on 22 April 2020. The review conforms to the PRISMA statement; protocol was registered in PROSPERO (CRD42019139388). ***Results:*** Nearly all the models considered in the 27 analysed papers include age, sex, and chest pain symptoms. Other common risk factors are smoking, hypertension, diabetes mellitus and dyslipidaemia. Only one model considers genetic profile. Reported AUCs range from 0.51 to 0.81. Relevant heterogeneity sources have been highlighted, such as the sample size, the presence of a PTP cut-off and the adoption of different definitions of CAD which can prevent comparisons of results and meta-analysis. Very few papers address a complete validation, making then impossible to understand the reasons why the model does not show a good discrimination capability on a different data set. ***Conclusions:*** We recommend a more clear statement of endpoints, their consistent measurement both in the derivation and validation phases, more comprehensive validation analyses and the enhancement of threshold validations of PTP to assess the effects of PTP on clinical management.

HP2
PATIENT-PROVIDER COST DISCUSSIONS AND OUT-OF-POCKET COSTS AMONG CANCER SURVIVORS WITH VARYING LEVELS OF CANCER-RELATED FINANCIAL HARDSHIPS

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Objectives: Previous research showed patient-provider cost discussions may reduce cancer survivors' out-of-pocket spending. Meanwhile, survivors who experienced cancer-related financial hardships may be more likely to have cost discussions. This study examined whether cost discussions and financial hardships were related to out-of-pocket spending. ***Methods:*** Using the 2016–2017 Medical Expenditure Panel Survey Experiences with Cancer Survey, survivors were classified as with or without a detailed discussion about out-of-pocket cancer care costs, based on self-reports. The relationship between detailed discussion and out-of-pocket costs was estimated using generalized linear models with gamma distribution and log link. Model 1 covariates included age, sex, race/ethnicity, marital status, education, employment, income, region, insurance, overall health, comorbidities, ≥1 cancers, time since cancer treatment, ambulatory visits, hospitalization, and survey year. Model 2 additionally adjusted for cancer-related financial hardship intensity (presence of material, behavioral, and psychological hardships, range: 0, 1, 2+). Model 3 additionally included an interaction term for cost discussion and hardship intensity. ***Results:*** Among 1,428 survivors included, 11.4% (95% CI: 9.1%–13.7%) had a detailed cost discussion. Having a detailed discussion was associated with significantly lower out-of-pocket costs ($1,041) compared to without a detailed discussion ($1,389) (average marginal effect [AME]=$347, 95% CI, –$610 to –$30) in model 1, which remains significant after controlling for financial hardship (model 2: AME=–$365, 95% CI, –$616 to –$57). In model 3, having a detailed discussion was significantly associated with lower costs only among no-hardship or multiple-hardship survivors (no hardship: AME=–$380, 95% CI, –$688 to –$11; multiple hardships: AME=–$659, 95% CI, –$1056 to –$156), but not among single-hardship survivors. ***Conclusions:*** Detailed cost discussions were associated with reduced out-of-pocket costs independent of financial hardship intensity, yet the reduction extent may vary by hardship intensity and warrants further investigation. Providers should continue to be encouraged to have detailed cost discussions with patients.

HP4
DOSE MEDICAID EXPANSION PROVIDE AFFORDABILITY OF HELATHCARE SERVICE FOR ASTHMA POPULATION

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Objectives: The purpose of this analysis is to estimate the impact of Medicaid expansion in 2014 on healthcare services among asthma patients. ***Methods:*** A retrospective cross-section study was conducted among asthma patients aged 26-64 years in the United States between 2007-2018 using the Medical Expenditure Panel Surveys. The total expenditure and utilization of healthcare services, including prescription drugs, emergency department (ED) visits, hospital inpatients stay, outpatient department visits, office-based medical provider visits, and home health visits, served as the outcome variables. The study sample included 9,564 adults identified as having asthma by Clinical Classifications Software (CCS) disease categorization scheme. We excluded individuals who were covered by Medicare. We estimated a difference-in-difference (DID) design compared two outcomes of patients under 138% federal poverty level (FPL) and upper 138% FPL before and after the Medicaid expansion. The expenditures of healthcare services were estimated by two-part model with logit in the first part and generalized linear model in the second part. The utilization was estimated by negative binomial regression. Other covariates were included to adjust potential confounding factors. Expenditures were inflated to 2018 US dollars as a common year by using the Medical Care component of the Gross Domestic Product (GDP) price index. Estimates were survey-weighted and adjusted for complex multi-stage sampling design. ***Results:*** A significant difference was found in asthma prescription drug expenditure and utilization. The DID estimates indicated that the Medicaid expansion increased expenditure by $344.39 ($p<0.001$) and utilization by 2.15 claims ($p<0.001$) for asthma population under 138% FPL after Medicaid expansion. Expenditures of outpatient department visits decreased by 65.9% ($p<0.01$) for asthma population under 138% FPL after Medicaid expansion. ***Conclusions:*** Medicaid expansion were benefit to asthma patients under 138% FPL, especially on prescription drug utilization.

Health Technology Assessment Studies

HT1
EFFECTS OF STAKEHOLDER ENGAGEMENT WITH ICER ON COST-EFFECTIVENESS OF NEW INTERVENTIONS: LESSONS LEARNED FROM A CRITICAL REVIEW OF EVALUATIONS FROM 2018 TO 2019

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Objectives: Since its foundation in 2006, the Institute for Clinical and Economic Review (ICER) has had increasing influence on drug pricing and reimbursement decisions in the US. Such decisions directly affect all stakeholders—insurers, providers, manufacturers, patients, and others—yet there is little synthesis of the effectiveness of engagements by stakeholders on ICER's assessment of the cost-effectiveness of new interventions. The objective of this study is to evaluate the effectiveness of stakeholder engagement approaches and inform stakeholders of their potential role in collaborating with ICER. ***Methods:*** ICER evaluations from 2018 (n=12) and 2019 (n=8) were systematically reviewed. Key characteristics were extracted from 172 letters with a total of 1,463 comments documenting interactions between ICER and all stakeholders. Stakeholder engagement approaches were analyzed in terms of their effectiveness indicated by ICER's modification of its original cost-effectiveness analysis. ***Results:*** 30% of reviewed letters and 5% of comments resulted in a change in ICER's base-case analysis (49 comments in 2018, 23 in 2019); nearly half of these comments included specific data or a published article to support the stakeholder's recommendations. Other common types of suggestions that resulted in analysis revisions included comments relating to inconsistent model inputs across treatments (12/49 in 2018, 5/23 in 2019), clinical validity (12/49 in 2018, 0/23 in 2019), and concerns based on patients' perspectives (1/49 in 2018, 5/23 in 2019). Although these comments led ICER to amend the analysis, the revisions rarely affected ICER's conclusion on the cost-effectiveness of evaluated

interventions. Three out of the 172 letters were associated with a change in the cost-effectiveness conclusion. ***Conclusions:*** Between 2018 and 2019, stakeholders have leveraged ICER evaluations as an opportunity to promote dialogue about the evidence of the value of technologies. Although stakeholders' inputs had little influence on ICER assessment's cost-effectiveness analysis conclusions, actionable, evidence-based recommendations were often accepted.

HT2
EVALUATION OF TUCATINIB FOR HER2-POSITIVE BREAST CANCER PATIENTS WITH BRAIN METASTASES: A UNITED STATES-BASED COST-EFFECTIVENESS ANALYSIS

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Objectives: To evaluate the cost-effectiveness of tucatinib in human epidermal growth factor receptor 2 (HER2)-positive breast cancer (BC) patients with brain metastases (BMs) and the subgroup of active BMs from the United States (US) payer perspective. ***Methods:*** A three-state Markov model was developed to compare the cost-effectiveness of tucatinib, trastuzumab and capecitabine (TTC) with placebo, trastuzumab and capecitabine (PTC) in HER2-positive BC patients with BMs;subgroup analysis of active BMs was also performed.Pseudo-individual patient data were generated from digitized Kaplan-Meier curves.Costs were derived from official databases and the literature.Health state utility values were consistent with published literature and adjusted by adverse events.Lifetime costs,quality-adjusted life years (QALYs),incremental cost-effectiveness ratio (ICER) and incremental net health benefit (INHB) were estimated.The willingness-to-pay (WTP) threshold was $200,000/QALY.The robustness of the model was tested by sensitivity analysis and scenario analyses were also performed. ***Results:*** In patients with BMs,the PTC and TTC strategies cost $87,905.23 and $503,637.21,yielding 0.68 and 1.68 QALYs,respectively.While in the subgroup of active BMs,the two strategies cost $81,968.50 and $451,699.62 and the QALYs were 0.61 and 1.75,respectively.The ICERs yielded by TTC were $418,007.01/QALY and $324,465.03/QALY, and INHBs were -1.08 QALYs and -0.71 QALY, compared with PTC in these two groups,respectively.The results were most sensitive to the cost of tucatinib.Probabilistic sensitivity analysis suggested that the probability of TTC being cost-effective was low at the current WTP threshold in the patients with BMs and the subgroup of active BMs. ***Conclusions:*** The additional using tucatinib (TTC) is unlikely to be cost-effective in HER2-positive BC patients with BMs from the US payer perspective,-but shows a better economics in patients with active BMs.Therefore, selecting favorable population would be a good way to optimize the cost-effectiveness of tucatinib.To meet the economical demands of public health,it may be a preferable option to reduce the price of tucatinib or offer appropriate drug assistance policies.

HT3
WHAT IS VALUE? A SYSTEMATIC REVIEW OF VALUE ASSESSMENT FRAMEWORKS

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Objectives: To investigate how value is defined and measured in existing value assessment frameworks (VAFs) in health care. ***Methods:*** We searched PubMed, Embase, the Cochrane Library and Centre for Review and Dissemination from 2008 to 2019. We also performed backward citation chaining of included studies and previously published systematic reviews. Studies reporting the development of a VAF in health care were included. For each included framework, we extracted and compared the context, target users, intended use, methods used to identify value attributes (e.g., patient/public engagement), description of the attributes, and attribute scoring approaches. ***Results:*** Out of 8151 articles screened, 53 VAFs described in 56 articles were included. The value attributes included in 52 VAFs were grouped into nine categories, namely, health benefits (50/52, 96%), affordability (42/52, 81%), societal impact (39/52, 75%), the burden of disease (35/52, 67%), quality of evidence (31/52, 60%), cost-effectiveness (30/52, 58%), ethics and equity (25/52, 48%), unmet needs (22/52, 42%), and innovation (15/52, 29%). The remaining VAF uses three broad attributes for diagnostics: medical value, planning value and psychic value. Literature review has been used to identify value attributes in 34 VAFs. Patient/public was engaged in the development of only 11 VAFs. Weighting has been used to score 29 VAFs, among which 19 used the methods of multicriteria decision analysis (MCDA). ***Conclusions:*** Substantial efforts have been made to facilitate value assessment in health care. There are substantial variations in defining and measuring value. A particular concerning finding is that patient/public engagement was poor in this process.

HT4
PATIENT-RELEVANCE OF ENDPOINTS OTHER THAN OVERALL SURVIVAL (NON-OS ENDPOINTS) IN ONCOLOGY HEALTH TECHNOLOGY ASSESSMENTS BY THE FEDERAL JOINT COMMITTEE (G-BA) IN GERMANY

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Objectives: To investigate the G-BA's decisions regarding patient-relevance of non-OS endpoints across breast cancer (BC), chronic lymphocytic leukaemia, melanoma, non-small cell lung cancer, ovarian cancer, and prostate cancer (PC). ***Methods:*** All published G-BA appraisal reports (January 2011–October 2020) in the 6 selected indications were reviewed and relevant data were extracted for analysis. ***Results:*** Reviewed G-BA appraisals (n=101) yielded 307 individual decisions regarding patient-relevance of non-OS endpoints, employing 56 different outcome measures. Although in 74% of decisions (n=226/307) non-OS endpoints were deemed patient-relevant in general, in 79% (179/226) of these cases, no additional medical benefit was granted either due to lack of compliance with G-BA's methodological requirements, inadequate/missing data, or statistically insignificant results. The G-BA did not accept progression-free survival, metastasis-free survival, complete remission, and objective response rate measured per imaging or laboratory tests. Patient-relevance decisions for health status (n=59), quality of life (n=103), and pain (n=10) related endpoints were positive across all indications. Decisions regarding the patient-relevance of other non-OS endpoints were indication-specific and variable, e.g. relapses as proxy for the failure of therapy with curative intent were judged patient-relevant in both BC (neo-adjuvant and adjuvant settings) and melanoma (adjuvant setting), and symptomatic progression in the palliative setting in PC was judged patient-relevant. In comparison, time-to-first-subsequent-therapy and time-to-onset-of-cytotoxic-therapy were judged patient-relevant in principle, but not accepted due to methodological deficiencies, and/or lack of correlation with patient-relevant side-effects of subsequent treatment. ***Conclusions:*** Strict compliance with methodological requirements and specific relevance to disease context and treatment setting were key drivers of G-BA's acceptance of patient-relevance for non-OS endpoints. The impact of G-BA's stringent methodological requirements on establishing the holistic patient-relevance of non-OS endpoints requires further debate.

Impact of COVID-19 on Health Systems, Treatment, and Value

IN1
TREATMENT JOURNEY OF COVID-19 PATIENTS IN HOSPITAL SETTINGS

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Objectives: Severe cases of COVID-19 have overwhelmed hospital systems across the nation. To better understand patient's journey within hospital setting, this study described the treatment journey of COVID-19 patients from hospital admission to 30 days after discharge for inpatients and hospital-based outpatients. ***Methods:*** A retrospective cohort study was conducted using a large geographically diverse all-payer hospital administrative database (Premier Healthcare Database). Patients were identified by their first discharges between April 1 and July 31, 2020, with a principal or secondary discharge diagnosis of COVID-19 (ICD-10 diagnosis code, U07.1). ***Results:*** Of 369,894 patients, 39% were inpatients and 61% were outpatients. Inpatients were older (median age 64 vs. 44 years) and more likely to be male (52% vs. 44%) and have baseline comorbidity (60% vs. 19%) compared to outpatients. (All $p<0.05$). Among inpatients, 80% originated from home, 9% from another acute care facility, and 94% were admitted through emergency department (ED). Of these patients, 23% were admitted to intensive care unit, 16% (n=22,665) died during initial hospitalization, 48% were discharged home, 14% to skilled nursing facility, 11% to home health, 6% were transferred to another hospital, and 3% to hospice. Within 30 days, an additional 0.7% (n=1,009) died, 4% were readmitted to same hospital, and 2% visited ED due to COVID-19. Among outpatients, 66% were ED outpatient visits. During initial visit, 91% were sent home, 2% were transferred to an acute care hospital, and 0.3% (n=712) died. An additional 0.4% (n=802) died, 7% visited ED, and 4% were hospitalized due to COVID-19 during follow-up visits within 30 days. ***Conclusions:*** This study shows that COVID-19 is associated with high-level of ED utilization, ICU admission, and in-