facilitate outreach and interventions to support patients with HF and increase their time at home.

Health Technology Assessment Studies & Methods

HT1
EVIDENCE OF METHODOLOGICAL HETEROGENEITY IN THE NICE APPRAISAL PROCESS DEPENDING ON ERG: A REVIEW OF SURVIVAL EXTRAPOLATION APPROACHES IN ONCOLOGY

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Background: The National Institute of for Health and Care Excellence (NICE) makes reimbursement recommendations estimating survival benefits of new oncology therapies based on extrapolations of immature survival data from clinical trials. Two main approaches to survival extrapolation are commonly used. These were proposed by Nicholas Latimer and Adrian Bagust, affiliated with the Liverpool Reviews and Implementation Group (LRiG) and Sheffield School of Health and Related Research (ScHARR) Evidence Review Groups (ERG) respectively. This research evaluates whether LRiG and ScHARR ERGs, assessing companies' submission to NICE, have preferences for either of the two extrapolation approaches. ***Methodology:*** All publicly-available NICE Single Technology Appraisals (STAs) in oncology critiqued by LRiG and SCHARR were reviewed (until 31/12/2019). Statistical comparisons were performed using Chi-square tests. ***Results:*** 60 oncology STAs were identified (LRiG reviewed 40, ScHARR 20). In 68% (41/60), Latimer's approach was preferred by companies (LRiG: 65% [26/40]; ScHARR: 75% [15/20]). The ERG preferred approach was Latimer's in 37% (22/60) of cases (ScHARR: 80% [16/20]; LRiG: 15% [6/40], $p<0.001$) and Bagust's in 63% (38/60) (ScHARR: 20% [4/20]; LRiG: 85% [34/40]). LRiG were significantly more likely to prefer Bagust's approach when the company's base case adopted Latimer's (77%, 20/26) than ScHARR (7%, 1/20). ScHARR agreed with Latimer's approach more often (93%, 14/15) than Bagust's one (50%, 3/6) while LRiG never preferred Latimer's approach to Bagust's when the latter was used in the companies' base case (0%, 0/14). This propensity for different approaches was statistically significant ($p<0.001$). ***Conclusions:*** Latimer's fully parametric approach was preferred over Bagust's piecewise in most companies' submissions, independently of the ERG reviewing the analyses. A significant preference for Bagust's approach was observed by LRiG, while ScHARR appeared neutral to submitted methodologies. This heterogeneity might translate into different potential survival estimates and therefore appraisal outcomes depending on the ERG assigned to critique companies' submissions.

HT2
APPLYING MULTI CRITERIA DECISION ANALYSIS TO GUIDE HEALTHCARE DECISION MAKING IN A DEVELOPING COUNTRY

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Objectives: The Multi-criteria decision analysis (MCDA) approach has been promoted as a mean to support systematic consideration of a broad range of decision criteria when appraising healthcare interventions. While it is important to capture all relevant aspects of value, these may not be fully transferable without considering country-specific aspects. The objective of this exploratory analysis is to discuss which criteria would be relevant in value determination for a pharmaceutical product in the Lebanese context. ***Methods:*** A face-to-face workshop was conducted as part of ISPOR Lebanon Chapter in February 2019 and included a presentation of the concept of MCDA and the two frameworks, EVIDEM and ADVANCE. During the workshop, 37 participants expressed their individual preferences through interactive exercises comprising of a qualitative exploration of criteria and their relevance in decision making and a quantitative exercise aiming at ranking (weighting) the different criteria to reflect their relative importance. ***Results:*** In the qualitative analysis of both frameworks, participants unanimously agreed on the relevance of comparative efficacy, safety, impact of medical costs. In EVIDEM, disease severity and unmet needs were also considered to be important criteria by more than 90% of the participants. In the quantitative analysis of both frameworks, disease severity ranked first (mean normalized weight of 0.1 in EVIDEM and 0.27 in ADVANCE), followed by the size of the population (0.09), the type of therapeutic benefit patient- level (0.09), population-level (0.08) and the efficacy (0.07) in EVIDEM. In ADVANCE, the combined unmet need/disease severity criteria were followed by the direct and meaningful endpoints (0.15), safety (0.12), contraindications (0.08), and indirect surrogate endpoints (0.07). ***Conclusions:*** This survey's results were concordant with those reported in countries that have conducted similar surveys such as France, Italy and Spain. MCDA methodology could be used as a cornerstone to enhance evidence-based discussions among Lebanese stakeholders involved in decision-making processes.

HT3
SYSTEMATIC ASSESSMENT OF HTA DECISIONS FOR PERSONALIZED MEDICINES FOR AN ORPHAN DISEASE: ACUTE MYELOID LEUKEMIA (AML)

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Objectives: AML is a rare, aggressive cancer with few available personalized treatments. These high-cost drugs are in the focus of HTA bodies and reimbursement decisions globally. The present research examines HTA assessments for AML drugs. ***Methods:*** 7 HTA bodies were screened: US (ICER), England (NICE), Scotland (SMC), France (HAS), Canada (pCODR), Australia (PBAC) and Germany (G-BA) for the assessment of 4 drugs (Midostaurin, Gemtuzumab-ozogamicin, Daunorubicin/Cytarabine and Enasidenib) for AML treatment, approved in the last 5 years (since 2015). ***Results:*** ICER assessed no drugs for AML. Midostaurin: All HTA bodies made a positive assessment for newly diagnosed FLT3+ AML. NICE and SMC with a restriction for the use [Patient Access Scheme (PAS) / Commercial agreement]. G-BA and HAS assessed the additional benefit with different gradings (Considerable and ASMR IV respectively). In Germany a price reduction of 26% was agreed after G-BA assessment. Daunorubicin/Cytarabine: NICE, SMC, G-BA and HAS made a positive assessment for newly diagnosed, therapy-related AML or AML with myelodysplasia-related changes. In Germany, a price reduction of 18% was agreed after G-BA assessment. Gemtuzumab-ozogamicin: NICE, SMC, G-BA and HAS made a positive assessment for untreated de novo CD33+ (AML) except acute promyelocytic leukemia. NICE and SMC with a restriction for the use (PAS / Commercial agreement). G-BA assessed the added benefit as Not Quantifiable, with a price reduction of 36% after G-BA assessment. HAS rated ASMR V. Enasidenib: pCODR did not recommend reimbursement for relapsed/refractory AML (IDH2 mutation). ***Conclusions:*** HTA assessment depicted varying outcomes and decisions due to differences in the applicable underlying laws, and patient population across drugs assessed. Major factors driving decisions were, superior efficacy and acceptable safety for HAS and G-BA; clinical benefit and cost-effectiveness for pCODR, PBAC, NICE and SMC; and end of life criteria across HTAs. Cost-effectiveness for NICE, SMC was by PAS under a commercial agreement with manufacturers.

HT4
ASSESSMENT OF THE IMPACT OF FRENCH ATUS ON HAS REIMBURSEMENT DECISIONS

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Objectives: To study the relationship between the ATU status, reimbursement decisions, and their underlying metrics (SMR ratings, ASMR levels, and reimbursement rates). ***Methods:*** A total of 1,645 reimbursement decisions from the last five years (2015 to 2019) were collected from the **Haute Autorité de Santé** (HAS) website irrespective of disease condition. Relevant data regarding the reimbursement decision, Temporary Authorization for Use (ATU) statuses, additional benefit (SMR) ratings, improvement in additional benefit (ASMR) levels, and reimbursement rates were then extracted from these documents to create a structured database. The ATU status was captured as a "Yes" or "No." HAS SMR levels (substantial, moderate, low, and insufficient), ASMR ratings (a scale of 1 to 5), and reimbursement rates (100%, 65%, 35%, 30%, 15%, and 0%) were used. The impact of ATUs on reimbursement decisions was evaluated first. The underlying metrics were then studied. Chi-squared testing was further used to measure significance. ***Results:*** There was no correlation between ATUs and overall reimbursement decisions by HAS ($p = 0.481$). However, there was a correlation between drugs having an ATU and a better ASMR level ($p < 0.001$). There was also a correlation between drugs having an ATU and receiving a higher reimbursement rate, particularly 100% reimbursement ($p < 0.001$). In addition, drugs with a proposed ATU that received a negative reimbursement decision either did not present clinical data or presented data that were deemed insufficient by HAS. ***Conclusions:*** With this analysis, it was observed that a positive ATU is associated with a better ASMR level and a higher reimbursement rate. It shows that the ATU pathway is often granted to drugs that then demonstrate some improvement in additional benefit, and the pathway may be associated with a financial benefit for pharmaceutical companies.

Medicaid, Medicare, and Commercial Insurance Studies

MC1
THE EFFECT OF MEDICAID EXPANSION ON CANCER SCREENING RATE: A DIFFERENCE-IN-DIFFERENCE-IN-DIFFERENCE MODEL

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Objectives: This study aimed to evaluate if Medicaid expansion improved cancer screening, especially for prostate cancer, colorectal, breast and cervical cancer, comparing lower with higher household income among non-elderly adults.

Methods: This study used the Behavior Risk Factor Surveillance System, a nationally representative health-related telephone survey, to compare cancer screening rates using surveys of 2012, 2014, 2016 and 2018 based on Medicaid expansion status. A difference-in-difference-in-difference (DDD) model was used to compare the trends. Several sample populations were included in this study for different types of cancer screening. All states were analyzed in this study. States expanded Medicaid during the study period were regarded as the treatment group, otherwise, as a control group. Robustness checks were conducted after main analysis. Statistical analysis was conducted in Stata/SE 15.1 (StataCorp LLC, College Station, TX). ***Results:*** Medicaid expansion slightly improved screening rate by 2%, 0.3% and 2% respectively for breast cancer, cervical cancer and prostate cancer for respondents whose income were below or at 138 % federal poverty line (FPL) in expansion states comparing respondents whose income were over 138 % in non-expansion states. The screening rate for prostate cancer had a marginally significant improvement, increased by 4% comparing respondents with household income below or at 138 % FPL in expansion states with respondents with household income over 400 % FPL in non-expansion states. And these effects have disparities in different racial groups. ***Conclusions:*** The effect of Medicaid expansion on cancer screening was not significant for most cancer screening in this study and only marginally significant for prostate cancer when comparing respondents with household income below 138 % FPL in expansion states with respondents with household income over 400 % FPL in non-expansion states.

MC3
DISPARITIES IN HEALTH INSURANCE STATUS AMONG YOUNG ADULT CANCER PATIENTS IN STATES WITH AND WITHOUT MEDICAID EXPANSION: ANALYSES OF THE SURVEILLANCE, EPIDEMIOLOGY AND END RESULTS REGISTRIES, 2007 - 2016

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Objectives: Health insurance coverage is an important determinant of outcomes among cancer patients, particularly for young adults in the U.S. who have the highest rates of being uninsured. Our objective was to measure the impact of the Affordable Care Act provision of Medicaid expansion on uninsured rates among young adult cancer patients. ***Methods:*** We conducted a retrospective cohort study of adults ages 20-39 years diagnosed with cancer between 2007 and 2016 in the Surveillance, Epidemiology, and End Results Program registries. We collected information on sociodemographics, clinical characteristics, insurance status at diagnosis and Medicaid expansion status. Covariate-adjusted difference-in-differences (DID) analyses were performed to determine changes in rates of uninsured young adult cancer patients over time. ***Results:*** From an overall cohort of 9,103 young adult cancer patients identified in 18 population-based registries, 7,196 (79%) resided in states with Medicaid expansion occurring by 2014. Expansion states experienced a reduction in the proportion of uninsured young adult cancer patients in 2014–2016 compared to 2007–2009 (11.3% to 9.1%, diff -2.2%), whereas non-expansion states did not (16.2% to 20.3%, diff 4.1%; DID -6.4%, P<0.01). Reductions in uninsured rates were most consistent among patients ages 20-29 years (DID -11.1%, P=0.047) and non-Hispanic white patients (DID -8.7%, P<0.01). No statistically significant reductions in uninsured rates attributable to Medicaid expansion were observed among among adults ages 30-39 years (DID -5.0%, P=0.07) and non-Hispanic black (DID -5.2%, P=0.37), Hispanic (DID -4.5%, P=0.66) and non-Hispanic Asian/Pacific Islander patients (DID -7.7%, P=0.32). ***Conclusions:*** Between 2007 and 2016, rates of uninsured young adult cancer patients in Medicaid expansion states decreased, whereas there was a relative increase in rates of uninsured young adults with cancer in non-expansion states. Future research and policies to expand health coverage for young adults should consider the unequal gains observed across age and racial/ethnic minority groups.

MC4
IMPROVEMENT IN MEDICATION ADHERENCE FOR MEMBERS ENROLLED IN A ZERO DOLLAR COPAY PROGRAM IS SENSITIVE TO SOCIOECONOMIC STATUS: A BLUE CROSS BLUE SHIELD OF LOUISIANA PERSPECTIVE

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Objectives: Blue Cross Blue Shield of Louisiana (Blue Cross)'s Zero Dollar Copay (ZDC) program removes the copay for a large set of medications related to certain chronic diseases. We aimed to evaluate the effects of the ZDC program on medication adherence by drug class and socioeconomic status. ***Methods:*** We analyzed Blue Cross members aged 18 years and above who were continuously enrolled in a chronic disease management (DM) program (asthma, chronic obstructive pulmonary disease, coronary heart disease, hypertension, diabetes, or chronic kidney disease) from March 2017 to March 2019. The ZDC treatment cohort was comprised of fully-insured members who had Blue Cross pharmacy benefit that included copays. Members without a copay or who were covered by employers contracting for administrative services only were included in the control group. All study participants were taking ZDC program-related drugs during the study period with at least 1 month of claims following ZDC enrollment. Propensity score weighting was performed to control for several baseline factors, and difference-in-difference (DID) regression models were used to measure program effects. ***Results:*** Adherence rates in the ZDC cohort increased for most drug classes compared to the control group, and the largest DIDs were observed for diuretics (8.4%), anti-diabetics (6.2%), and calcium channel blockers (6.1%). Across all income levels, average medication adherence increased for members in the ZDC group relative to controls. Members in the lowest income bracket (income between $0 and $39,000) showed the greatest improvement in medication adherence compared to other income groups, with average rates increasing by 1.2% in the ZDC group and decreasing by 2.4% in the control group. ***Conclusions:*** The ZDC program increased medication adherence rates relative to controls, an effect that was primarily driven by members with lower socioeconomic status.

Missing Data Studies

MD2
COMPARISON OF COVARIATE BALANCE AMONG PROPENSITY SCORE MATCHING VERSUS PROPENSITY SCORE WEIGHTING AND STRATIFICATION IN OBSERVATIONAL MEDICAL DEVICE RESEARCH

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Objective: Propensity score matching (PSM) is a popular statistical technique to mitigate confounding by measured variables in observational studies. The generalizability of PSM results may be threatened by loss of treated observations as a result of matching with a caliper. Propensity score weighting (PSW) and stratification (PSS) are alternative methods to achieving balance while retaining all treated cases. We compare these three techniques in a real-world study that evaluates the safety of a target medical device to similar devices. ***Methods:*** The Premier Healthcare Database, which comprises hospital billing records from over 970 hospitals in the US, was queried for all patients who had disposable electrodes used in surgery from January 2000 to December 2018. Patients were classified into target device group (treated) or comparison device group (control). Propensity scores were calculated with a logistic regression model that had 13 covariates, including but not limited to: age, gender, teaching status, and Charlson comorbidity score. For each covariate, standardized mean differences (SMD) were calculated before and after implementing PSM, PSW, and PSS. Covariate balance was assessed by the number of covariates with SMD < 0.1. ***Results:*** There were 298,505 patients in the treated group and 329,664 patients in the control group. Prior to balancing, 9 out of 13 covariates were unbalanced. After 1:1 PSM (caliper = 0.2), 230,707 (77.3%) patients were retained in the treated group and 12 covariates were balanced. PSW resulted in all treated patients retained and all 13 covariates balanced. PSS (strata=10) also had all treated patients retained, but 8 covariates remained unbalanced. ***Conclusion:*** PSW achieved balance on all covariates while retaining all treated cases, but PSM resulted in a substantial loss of treated cases and PSS led to residual imbalance in some covariates. Further analysis is warranted to compare the estimates of safety outcomes after the implementation of three covariate balance techniques.

MD3
RISK ESTIMATION BY BOOSTED DOUBLY ROBUST METHOD

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Objectives: The choice of a covariate adjustment method may affect risk estimates in observational studies. We developed a method, the boosted doubly robust (BDR), that can effectively handle numerous correlated covariates and reduce bias and variance in the effect estimates. The method may be applied to many outcome analyses including costs. ***Methods:*** BDR combines the merits of boosted propensity scoring (BPS) and doubly robust (DR) estimation. BDR first uses BPS to match the joint distribution of the pre-treatment covariates. Secondly, BDR uses an outcome model to handle residual confounding. Statistical arguments suggest that BPS reduces the bias in the risk estimates and that DR reduces bias and variance still further. As an example, we examined the established association between diazepam, a long-acting benzodiazepine, and alprazolam, a short-acting benzodiazepine, and risk of injury using BDR and conventional adjustment methods including no adjustment, Poisson regression, propensity scoring using logistic regression (LPS), and high dimensional propensity scoring (HDPS). ***Results:*** The study included 78,829 and 118,579 patients with a prescription for diazepam or alprazolam respectively in the IBM MarketScan Database. We compared risk of treatment in the 1-15 days following the initial prescription (post-treatment) with the risk in the 1-365 days prior to treatment (pre-treatment) and computed the post- to pre-treatment rate ratio (RR) in each treatment cohort. We computed the ratio of the RRs