

OBJECTIVES: Waste in prescribing, dispensing, and consumption of medications in community settings significantly impacts the US Health Care System. This research examines waste associated with the medication use process which consists of any written prescriptions that are not (1) taken to a pharmacy to be filled, (2) taken to be filled but abandoned at the pharmacy, or (3) result in a medication being dispensed but not consumed as directed. The aim of this study is to quantify the costs of medication waste in the United States exclusive of impact on health outcomes. **METHODS:** A review of published literature and data from the 2012 Medical Expenditure Panel Survey was used to quantify the number of prescriptions wasted at different stages of the medication prescribing and use process. Costs associated with medication waste included physician time and overhead lost writing prescriptions, pharmacist time and overhead lost filling prescriptions, and ingredient costs of medications not used. **RESULTS:** In 2012, more than 8 million prescriptions were either unfilled or abandoned, and 70 million resulted in dispensed medications that were not used. The total cost of this waste was estimated at more than \$14 billion. This result excluded any additional costs associated with not achieving desired health outcomes. **CONCLUSIONS:** Patients who do not fulfill their role in the medication use process cause significant, avoidable costs to the health care system beyond the health outcomes not achieved.

PHP67

IMPACT OF POST-SURGICAL COMPLICATIONS ON HOSPITAL COSTS AND MARGINS

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OBJECTIVES: Patients undergoing major surgeries often experience post-surgical complications. The impact of post-surgical complications on hospital costs has been extensively studied but the impact on margins remains a subject of controversy. We assessed the financial consequences of postsurgical complications in high-risk US Medicare patients undergoing specific procedures. **METHODS:** Data from Medicare patients with ≥ 1 comorbidity who had major cardiac, vascular, gastro-intestinal and orthopedic surgical procedures in 2011 were identified in the CMS database. Post-surgical complications and financial information (in 2011 US\$) were extracted from Medicare Standard Analytic Files and Hospital Cost Reports. Hospital margin was calculated as Medicare payments minus hospital costs. A total of 63 procedure codes (ICD-9-CM) were analyzed. **RESULTS:** Of 303,432 Medicare patients undergoing major surgery, mean costs were significantly higher for patients with at least one complication than for patients without any complication in each procedure category. For example, the mean cost per cardiac procedure patient with complication was \$46,535, but only \$32,887 per cardiac patient without complication. For each of the four procedure categories, average hospital margins were approximately \$1,500–\$2,500 higher for patients without than with complications: \$1,508 for cardiac patients, \$2,336 for gastro-intestinal, \$1,694 for orthopedic, and \$2,515 for vascular patients (all $p < 0.0001$). Weighted average margin were the Medicare cases with complication to be converted into cases without complication would be \$1,870 higher per case. For some procedure subgroups, the difference in average margin between cases with and without complications was even higher, such as in pancreatotomy (\$3,907 per case), aorto-iliac & peripheral bypass (\$3,614), resection of rectum (\$2,602), and partial hepatectomy procedures (\$2,303) (all $p < 0.0001$). **CONCLUSIONS:** Postsurgical complications have a significant impact on hospital margins. Enhanced Recovery Programs have potential not only to improve quality of care but also to improve hospital margins.

PHP69

WITHDRAWN

OBJECTIVES: Health care costs in Massachusetts (MA) are among the highest in the country. Thus, it is essential to gain an in-depth understanding of the patterns of healthcare resource utilization and expenditures in the state. This study examines healthcare spending in the state by care setting, and compares where most spending occurs for Medicaid and private payers. **METHODS:** We used the 2012 MA All Payer Claims Database, which included medical and pharmacy claims from all commercial payers and certain public programs (Medicare Part C only and Medicaid) to calculate healthcare utilization and expenditures for the state's population (N=6,549,289 individuals), including patient out-of-pocket payments. Traditional Medicare claims were not included in this analysis. We conducted descriptive analyses to calculate and compare total annual healthcare spending by site of service for Medicaid and private payers. **RESULTS:** Total healthcare spending for MA in 2012 amounted to \$25 billion for private payers and \$10.3 billion for the state Medicaid program. For private payers, pharmacy claims accounted for 27% of total healthcare spending, and the top sites of service by spending were hospital outpatient (26%), hospital inpatient (19%), and office visits (15%). For Medicaid, the biggest contributors to healthcare spending were office visits (22%), followed by hospital inpatient visits (17%), skilled nursing facility visits (16% versus only 0.3% for private), and home health visits (14% versus 1.5% in private), with pharmacy claims comprising 12% of spending. **CONCLUSIONS:** We identified differences in patterns of healthcare resource utilization and expenditures between Medicaid and private payers. These differences reflect demographic and pattern of care differences in the insured populations, as well as different payment policies and prices paid for services. In order to improve care quality, equity, and efficiency, it is important to understand how money is being spent by different segments of the healthcare market.

PHP71

PRODUCTIVITY GROWTH IN CALIFORNIA HOSPITALS FROM 2005 THROUGH 2011

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OBJECTIVES: The adaption of technological advances in the past decades underscores the importance of measuring how efficiently hospitals are utilizing the growing labor force to provide health services. Our study aimed to assess California hospital productivity growth through addressing the severity of patient's illness and outcomes of care. **METHODS:** We examined hospital productivity growth by analyzing patient discharge data from California for the period 2005 to 2011, among patient stays with a principal diagnosis of heart attack, pneumonia or heart failure. Productivity was defined by the ratio of the number of stays to total costs in each hospital-year. **RESULTS:** The study cohorts included 171,250 patient stays at 358 hospitals with a primary diagnosis of heart attack, 336,111 stays at 387 hospitals with pneumonia, and 389,413 stays at 383 hospitals with heart attack. Average costs per stay showed a slightly increasing trend from 2005 to 2011 (from \$22,965 to \$23,669 in heart-attack stays, from \$10,956 to \$12,238 in pneumonia stays, and from \$13,279 to \$14,144 in heart-failure stays, all in 2011 dollars). The average number of patient comorbidities increased by 37% for heart attack, 28% for pneumonia, and 87% for heart failure. A decreasing trend was observed in inpatient mortality rate, ranging from 26% for heart attack to 19% for pneumonia. Unadjusted annual productivity growth rates were significantly negative (-0.7% per year for heart-attack stays, -2.4% for pneumonia stays, and -1.5% for heart-failure stays). In contrast, after adjustment for patient severity of illness and inpatient survival, annual productivity growth rates became +0.4% per year for heart attack and +0.2% for heart failure; growth for pneumonia was no longer significantly negative. **CONCLUSIONS:** Accounting for patient severity and quality of care, as is appropriate, results in substantially more favorable trends in productivity growth at California hospitals.

PHP72

IMPACT OF THE SHIFT TO MEDICAID MANAGED CARE ON RESOURCE UTILIZATION AND COSTS FOR BENEFICIARIES IN MISSISSIPPI MEDICAID

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OBJECTIVES: As have many states, Mississippi Medicaid has witnessed a major shift from fee-for-service to managed care with in the last few years. In November 2012, managed care enrollment was increased to almost 30% with the aim of improving health care service quality and reducing costs. However, the effects of this shift of patients to managed care has not been thoroughly evaluated. This project aimed to evaluate the impact of the shift of patients from fee-for-service to managed care on health care utilization, quality and costs. **METHODS:** A retrospective analysis was conducted using Mississippi Medicaid FFS administrative claims and beneficiary eligibility data for the period November 1, 2011 through December 31, 2013. A cohort of beneficiaries were identified who were continuously enrolled for this period and spent the first 12 months enrolled in fee-for-service and the next 12 months in managed care. Various outcomes were measured for the first 12-month and the second 12-month periods. An additional cohort of beneficiaries who were enrolled in fee-for-service for the whole duration of the study period were also followed on the same measures as a control group. **RESULTS:** The number of medications filled, number of office visits, intensity of office visits, total pharmacy costs and total outpatients costs were found to increase after the shift to managed care. Days of inpatient stay, inpatient costs and ER costs all decreased. It appears that the shift to managed care has caused an increase in outpatient and pharmacy utilization and costs and a decrease in inpatient costs. **CONCLUSIONS:** The shift to managed care seems to have a mixed effect on health care use and spending for Mississippi Medicaid beneficiaries. Increased use of outpatient services while inpatient costs decrease may indicate a more appropriate level of care being used. Further analysis is needed to provide conclusive results.

PHP70

WHO IS SPENDING WHERE: ANALYSIS OF HEALTHCARE SPENDING BY MEDICAID AND PRIVATE PAYERS IN MASSACHUSETTS

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PUBLISHED COSTS OF MEDICATION ERRORS LEADING TO PREVENTABLE ADVERSE DRUG EVENTS IN US HOSPITALS

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OBJECTIVES: Medication errors (ME) are defined as any preventable event that may cause or lead to inappropriate medication use or patient harm. ME are garnering national attention as evidenced by the National Action Plan for Adverse Drug Event Prevention to drive prevention strategies for high-risk drug classes. We sought to understand the economic burden of ME that lead to preventable adverse drug events (pADEs) in US hospitals. **METHODS:** From a broader literature review on injectable ME in Medline and Embase (2003-2014), we identified eleven articles related to the incidence and economic impact of pADEs arising from all ME. A supplemental PubMed search identified four additional articles dating back to 1995. All cost estimates were converted into 2014 dollars. **RESULTS:** Published estimates of ME cost varied based on population, setting of care, methodology and study period. Three studies estimated the annual cost of pADEs for the inpatient setting at the national level. A 1999 study estimated that annual national costs of pADEs were \$4.8 billion, while a 2012 study showed that injectable-related pADEs alone cost \$2.8-5.2 billion. For Medicare beneficiaries, pADEs cost \$617 million annually. At the individual hospital level, the total annual cost of pADEs ranged from \$0.9 to \$5.6 million. Costs per individual pADE differed based on severity, and ranged from \$3408 to \$6931. Key cost drivers included increased length of stay, additional laboratory testing, routine care, surgical, and other ancillary charges. **CONCLUSIONS:** This literature review highlights the economic burden of ME in the US. Cost estimates varied considerably due to different definitions, study methodologies, and analytic scope. Given the emergence of pADE harm reduction as a national priority, there is a need for updated research aimed at evaluating the economic impact of medication errors using standardized definitions for types of errors, their severity and the ensuing financial impact.

PHP74

THE FINANCIAL IMPACT OF BLOOD SPECIMEN REJECTION DUE TO THE POOR PRE-ANALYTICAL QUALITY IN HEALTHCARE FACILITY IN CHINA

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OBJECTIVES: To quantify the financial impact of poor blood specimen quality on treatment and hospital costs in a healthcare facility in China, using institution specific data. **METHODS:** The data were collected from six hospitals (beds ≥ 500) in Beijing, Shanghai and Guangzhou by interviewing institution staff, including operational data such as total operating costs, medical treatment data such as probability of a low, medium or high impact of a rejection, laboratory data such as total number of blood tests. The patients were divided into three categories: critical inpatients, routine outpatients, and elective surgery inpatients, since the costs of an error vary greatly among the three categories. Finally, the data were entered into a model to calculate the possible financial impact of blood specimen rejection. **RESULTS:** The estimated average costs of a blood specimen rejection were \$56, \$250 for critical inpatient, \$31 for other inpatient, and \$39 for outpatient, respectively. On average, pre-analytical specimen error costs were \$494,422, accounting for 0.12% of total hospital operational costs. The impact of errors on efficiency can be assessed by hours lost, there is an estimated 16,913 total patient hours was lost in one year, equaling to short of 4029 patients treatment. 3.62% (612) of hours lost was due to laboratory redraw and retest, and 96.38% (16,301) was due to patient treatment. In a healthcare facility, patient treatment costs represent the largest cost category at 92.18%, redraw costs at 3.21%, instrument downtime costs at 2.99%, lab investigation costs at 1.57%, and blood collection consumables at 0.05%. **CONCLUSIONS:** Blood specimen rejections due to the poor pre-analytical quality increase operational costs and decrease the efficiency of hospitals, healthcare facility should monitor pre-analytical blood processes and use high-quality device to decrease pre-analytical errors.

PHP75

REGIONAL VARIATION IN CATASTROPHIC HEALTH CARE SPENDING IN PAKISTAN

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OBJECTIVES: This analysis investigates regional variation in catastrophic health care spending in Pakistan. **METHODS:** The study draws data from three rounds of Pakistan Living Standards Measurement Survey (PLSM) conducted in both rural and urban areas of Pakistan in 2005-06, 2007-08 and 2010-11. A household is classified as incurring catastrophic health expenditure if 10% or more of its annual expenditure is on health care. Household economic status is measured using household annual consumption expenditures and households are categorized into quintiles. **RESULTS:** The proportion of households incurring catastrophic health care expenditure has declined from 7.5% in 2005-06 to 3.2% in 2010-11. The decline has been slightly more in case of rural households than in urban (4.9% urban and 9.1% rural households in 2005-06 vs. 2.0% urban and 3.8% rural households in 2010-11 incurred catastrophic health care spending. Of poorest households, 7.5% incurred catastrophic health expenditure in 2005-06, 5.4% in 2007-08 and 3.5% in 2010-11 whereas, of richest, the proportion was 6.2%, 5.4% and 2.7% for respective periods. Further, significantly more households in Punjab are incurring catastrophic health care expenditure compared to Sindh. There is regional variation across regions and remarkable decline in catastrophic health care spending. South Punjab had the highest proportion (13.6%) while south Sindh had lowest proportion (2.4%) of households incurring health care expenditure in 2005-06. South Sindh still has the lowest proportion (0.4%) whereas, north Punjab replaces south Punjab having the highest proportion (5.4%) of households incurring catastrophic health expenditure in 2010-11. **CONCLUSIONS:** Pakistan has registered a decline in catastrophic health care spending over the period. It could be associated with a decline in morbidity

over the period. However, cost of health care remains an important impediment to access health care particularly in rural areas.

PHP76

A LITERATURE REVIEW AND MICRO COSTING APPROACH TO DETERMINE THE COST OF ONE HOUR OF OPERATING TIME IN CANADA

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OBJECTIVES: There is little understanding on the true cost of operating room time in Canada despite the fact that surgical care is paid for by a single payer facing increasing cost constraints. The objective of the review was to analyze how OR costs are currently conceived of in Canadian hospitals. Additionally, a micro costing approach was used to estimate the actual cost using a bottom-up approach. **METHODS:** A literature search was conducted to determine how Canadian hospitals perceived the value of one hour of operating time. Studies satisfying the defined criteria were compared in terms of methodology and inclusion and exclusion of specific resources in their perception of their institution's OR expenditure. All costs were adjusted to 2014 Canadian dollars. Additionally, we conducted an independent bottom-up micro-costing analysis of Canadian operating room time. Completion of the literature review prior to micro costing ensured a robust and comprehensive approach was used. Costs were obtained using peer-reviewed literature and from a large Canadian hospital network. **RESULTS:** Specific search and inclusion criteria resulted in the inclusion of 5 studies in our analysis. The cost of OR time ranged greatly from \$621.60 to \$2288.94 per hour. All studies obtained the cost of OR time using a top-down case-costing approach informed with data from their respective finance departments. Each study was conducted at a different Canadian hospital and OR costs were perceived in strikingly different ways. Additionally, many of the studies lacked sufficient methodological details providing a challenge when comparing approaches. The bottom-up micro case-costing approach incorporated more than 30 individual costs and resulted in an OR hourly cost of \$1200. **CONCLUSIONS:** In Canada, there is little consensus between institutions of how to capture the costs of OR time. A bottom-up micro costing approach allowed for a different perspective and a more detailed analysis.

PHP77

CURRENT ESTIMATES OF THE PUBLIC PHARMACEUTICAL EXPENDITURE IN MONGOLIA

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OBJECTIVES: In less developed nations public resources are scarce and medicines are often not adequate, nor accessible for much of the population. Only limited quantitative data are available for analysis of the pharmaceutical expenditure in Mongolia. **METHODS:** Retrospective data collection on pharmaceutical expenditure from government issued reports were collected and analysed for the period of six years starting from 2009 until 2014. **RESULTS:** The gross domestic product (GDP) was 11.52 billion USD in 2013 in Mongolia and the proportion of total health expenditure (THE) was 566.5 billion Mongolian National Tugrug (MNT) or 301.4 million USD. For 2014, the total pharmaceutical expenditure (TPE) was 81.3 billion MNT or 11.6% of the THE. The public pharmaceutical expenditure (PPE) per capita was 28727.9 MNT or 15.3 USD in 2013. Mongolia is a developing country and the public expenditure on pharmaceuticals per capita was in the mid-range of developing country expenditure. The funding source of pharmaceuticals in Mongolia was analysed and the external source played a minimal role for TPE (4.8%) whereas government sourced fund (tax) was the highest (80.4%). Currently, no data are available on private health funds in Mongolia. Previous findings reported that out-of-pocket payments for health service has increased from 14.5% of the THE in 1995 to 41.4% in 2010. However, data in regards to out-of-pocket payment for pharmaceuticals were not available. **CONCLUSIONS:** This study provided country specific estimates of expenditure funded by public source at the national level in regards with total pharmaceutical expenditure and per capita. In addition, data on private funding for pharmaceuticals are required in order to conduct the specific policy analyses including different cost items, equity of access, allocative efficiency, therapeutic and operation efficiency. However, the results of this review can be used as a baseline for monitoring future trends in pharmaceutical expenditure over time in Mongolia.

PHP78

CROSS SECTION ANALYSIS OF MARGINAL NHS EXPENDITURE BY ENGLAND HEALTH AREA

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OBJECTIVES: The cost-effectiveness threshold applied in the process of recommendation of new health technologies is a central topic of discussion in the UK. A key element in the discussions is the marginal effect that a change on the health expenditure has on mortality per health category; since this is an indication of the opportunity cost of adopting a new technology. The common assumption is that all health areas behave in roughly the same way as each other when faced with a cut in available funds. This suggests that the opportunity cost, and consequently the threshold value, is the same regardless health area. This overlooks potential differences between health areas (e.g. the way in which health services are provided in different localities). If there are such differences then different health areas will be producing health gain in different ways, and will produce different health gains per pound spent. The primary aim of this study is to test the assumption that health areas are similar to one another in the decisions they make. **METHODS:** We applied the Cluster Analysis Methodology. We propose a division in which the health areas within one cluster are those that are similar to each other in terms of the expenditures (adjusted by costs differences and needs) allocated to each health categories. Four clusters partitions are estimated, each one based on a different year. By doing this, we are able to compare the composition of the different groups over time. **RESULTS:** The data indicates that some health areas spent dif-