report with inconsistent information on laterality itself. It correctly extracts 83% of 465 reports for assessment for right breast and 92% for assessment for left breast. Unstable gold standard impedes performance of the NLP algorithm for extracting parenchymal enhancement and clinical indications. There is no gold standard to show NLP performance for comparison exams yet. **Conclusions:** This NLP algorithm holds promise for rapid, accurate extraction of information from free-text breast MRI reports. Manual review will be faster and more accurate due to the pre-filling of the abstraction form. **Keywords:** Natural language processing; Breast MRI report

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PS1-16:

Effect of Insurance Plan Choice on Utilization in Kaiser Permanente Colorado

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Background/Aims: There has been a shift in recent years from traditional HMO-type insurance products to high deductible or co-insurance plans. Kaiser Permanente Colorado (KPCO) has also added new service areas to the region that include Southern and Northern Colorado. In addition, the impending Affordable Care Act will be implemented in 2014 which may bring new and different members to KPCO. There is a need to describe socio-demographic and clinical characteristics by plan type in order to understand how members within these different plan types utilize KPCO resources and what data are available and identifiable within our source data systems. These answers will enable us to establish appropriate inclusion and exclusion criteria for future research studies. **Methods:** All members with at least 1 day of membership from January, 2000 through July 2013 were identified. Membership within product lines and all associated utilization was based on calendar year. Patient characteristics, ambulatory visits, inpatient admissions, emergency department admissions, lab tests, tumors, pharmacy utilization and variations in therapy for certain diagnoses were obtained from the Virtual Data Warehouse (VDW). Socio-demographic characteristics, including gender, race, and age, were described by percentages. Clinical characteristics and variation in utilization were calculated on a per-person per-month measure and were compared for each region/insurance product/year combination. **Results:** Demographics and utilization varied across all product lines and years. An increase in the number of different products offered was observed over time. Members in the HMO plan type were more likely to be younger, less educated and use more resources than members in other products. Some data were not easily identifiable in certain plan types. **Conclusions:** These results indicate that demographic and clinical patterns do vary between plan types. These patterns need to be taken into account when creating cohorts in future research projects.

Keywords: Utilization; Insurance plans

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PS1-17:

Organization-wide Collaboration to Convert Binary Clinical Notes to Research-ready Text

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Background/Aims: Clinical text is an integral part of research at Group Health Research Institute (GHRI), supporting ongoing projects and new research proposals. Our clinical notes are stored in a single, full-text-indexed table that is populated nightly with all new notes in Group Health's Electronic Medical Record (EMR). These notes include those generated internally and those received from partner organizations via electronic interfaces. Recently one of our partners changed its interface from sending formatted text to sending binary PDF files. While this had little effect on clinical users, it made a significant amount of text data inaccessible for computerized processing. This text was crucial to ongoing research, so we needed to find a way to preserve access. **Methods:** A diversely-skilled team of technologists collaborated to solve the problem with the following

process. When the nightly HL7 file arrives at Group Health, it is copied to a research server and the message ID is stored with the appropriate encounter in the EMR. A scheduled Python script then extracts the message ID and binary PDF from each HL7 message. It converts the base64-encoded information into a PDF file and names it with the message ID for linking with the encounter. Finally, the script converts the PDF file into a text file using an open source library. The PDF and text files are archived, as is the nightly HL7 message. **Results:** From June to October 2013, this process has converted and archived over 30,000 notes from our partner that otherwise would not have been available for research. The files are also available to Group Health's claims auditing department, enabling Group Health to see a monetary return on the effort. **Conclusions:** Thanks to the open source community and strong connections between informatics management at Group Health Cooperative and GHRI, we were able to quickly salvage critical data for research when an externally-driven change to that information occurred. Before the end of 2013 we expect to integrate these converted text notes with our clinical text storage.

Keywords: Natural language processing; Data interfaces

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PS1-18:

Do Patients Use Online Messaging to Substitute for Office Visits and Phone Calls? Results from a Natural Experiment

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Background/Aims: We evaluated the effect of online messaging between patients and providers on other healthcare utilization. Messaging may increase the administrative burden on providers but may also substitute for utilization such as calls or visits. To identify the effect of messaging, we exploited a natural experiment, which occurred in 3/2011, when a large multispecialty practice in California lowered the price of messaging from \$60/year to free for patients and initiated incentives for doctors (\$3/thread), resulting in increased rates of patients messaging. **Methods:** We conducted a longitudinal study of 65,332 active primary care patients from 3/2009-3/2012. All patients in the study had activated their online portal before 3/2011 and none had paid to use messaging previously; 38,438 of these patients initiated a message following 3/2011. Messaging was measured by the number of threads initiated by patients annually. Outcome measures included annual rates of office visits and phone calls to primary and specialty care. The effects of messaging were identified through difference-in-differences analyses using generalized least squares, comparing the utilization of those initiating any messages with those not messaging, before and after messaging became free. Controls included patient fixed effects along with patient age, insurance type, Charlson score, continuity of care, and relevant characteristics of their primary care provider. **Results:** Comparing the rates of service use before and after 3/2011, between messaging and non-messaging users, we found no difference in the annual number of primary care phone calls (0.002 per patient-year, $P = 0.394$), and a small increase in primary care office visits (0.05 per patient-year, $P < 0.001$) for each thread initiated. For specialty care, we found an increase in 0.16 phone calls ($P < 0.001$) and 0.21 ($P < 0.001$) office visits per patient-year for each thread initiated. **Conclusions:** Among patients who were already using the online portal, use of secure messaging was associated with little difference in primary care utilization, but with a moderate increase in specialty utilization. Although current analyses controlled for patient and provider characteristics, patient self-selection may still threaten validity; we will address this through propensity score stratification in future analyses.

Keywords: Online messaging; Healthcare utilization

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Health Services Research/Health Policy/Costs

B2-1:

Estimation of Standardized Hospital Costs from Claims Data that Reflect Resource Requirements for Care

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Background/Aims: Payments to hospital providers are not solely driven by the resource requirements of individual patients, but also reflect payment policies specific to the health care payer and hospital provider. For example, Medicare adjusts payments to hospitals according to facility and local geographic characteristics that may not be relevant to studies estimating the associations of individual patient characteristics with true costs of care. We developed a method to estimate hospital costs using the diagnosis related group (DRG) payment weights on which Medicare bases hospital payments that reflect patient medical and surgical acuity. Our purpose was to compare cost estimates for hospital stays calculated using DRG payments weights to actual Medicare hospital payments. **Methods:** We used Medicare Provider Analysis and Review (MedPAR) files and DRG weight tables linked to participant data from the Study of Osteoporotic Fractures (SOF) from 1992 through 2010. Participants were women age 65 and older recruited in three metropolitan and one rural area of the United States. Standardized hospital costs were estimated using DRG payment weights for 1,397 hospital stays (assigned 182 separate DRG codes) for 795 SOF participants for one year following a hip fracture. Cost estimates based on Medicare payments included Medicare and secondary insurer payments, copay and deductible amounts. **Results:** The mean (SD) of inpatient DRG-based cost estimates per person-year were \$16,268 (\$10,058) compared to \$19,937 (\$15,531) for MedPAR payments. The correlation between DRG-based estimates and MedPAR payments was 0.71, and 51% of hospital stays were in different quintiles when costs were calculated based on DRG weights compared to MedPAR payments. **Conclusions:** DRG-based cost estimates of hospital stays differ significantly from Medicare payments, which are adjusted by Medicare for facility and local geographic characteristics. These findings also may apply to studies estimating associations of individual patient characteristics with health care costs across multiple payers (such as HMORN members) who have different payment policies based in part on local geographic and health care system characteristics (including contracts between specific payers and hospital providers). DRG-based cost estimates may be preferable for analyses when hospital, payer, and local geographic variation could bias assessment of associations between patient characteristics and costs.

Keywords: Hospital costs; Claims data

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B2-3:

Comparative Effectiveness of a Computerized Algorithm versus a Physician Instituted Protocol to Manage Insulin Infusions after Cardiac Surgery

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Background/Aims: Glucose management after cardiac surgery in our hospital was done using a locally developed paper insulin infusion protocol. Prolonged time to achieve and maintain target blood glucose was common and hypoglycemia was a significant problem. A computerized algorithm for insulin infusion was implemented and compared to the paper insulin infusion protocol. A barrier to effective implementation of this practice change was timed glucose measurements that consumed more nursing time. This was overcome by increasing nursing education and thereby efficiency. Hyperglycemia after meals and rapid glucose changes with glucose altering medications was addressed by adding extra glucose readings to allow the system to adjust the infusion rate. **Methods:** In order to assess the effectiveness of the new system, permission was received from the IRB to perform a retrospective chart review. Data for the paper protocol was obtained from 248 patient records during the time period of 7/1/11 to 12/30/11. Data for the computerized system was obtained from 181 patient records during the period of 8/1/12 to 5/2/13. Primary endpoints were time to achieve target glucose and hypoglycemia occurrence rates before and after intervention. The data was analyzed for time to achieve target glucose using a comparison of means and sample confidence levels for means of normal distributions with unknown variances. **Results:** Mean time to achieve target blood glucose before the intervention was 14.9 hours, and after the intervention was only 4.9 hours. Difference in time to achieve target glucose

was 10 hours ($P < 0.005$ with 99.5% confidence level). Percent of patients with blood glucose $< 40\text{mg}\%$ was 4.45% (11 of 248) and blood glucose $< 60\text{mg}\%$ was 20.6% (51 of 248) before the intervention. With the computerized insulin algorithm, percent of patients with blood glucose $< 40\text{mg}\%$ was 0 and $< 60\text{mg}\%$ was 0.55% (1 of 181). **Conclusions:** The management of postoperative insulin infusions with a computerized algorithm results in significant improvement in patient care delivery with more efficient glucose control, little hypoglycemia, and an average saving of 10 hours of intensive care stay and nursing time. The health economic implications of this finding are being studied.

Keywords: Insulin infusions; Post cardiac surgery

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B2-4:

Variations in the Cost of Ambulatory Care Episodes: An Opportunity for Improvement?

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Background/Aims: Policymakers are exploring bundled payments to providers, but little is known about their application in ambulatory care. As an example, this study examines the cost of acute bronchitis episodes. **Methods:** Data were from electronic health records and claims of a large ambulatory group practice with mixed payment sources. Optum's Symmetry Grouper was used to create episode treatment groups (ETGs) for all services. There were 78,828 episodes of acute bronchitis, cared for by 427 primary care physicians/urgent care centers (PCPs) (1,568 PCP-years) in 2007-2011. Costs included standardized fees for physicians, laboratory/imaging ordered, and specialist services. The grouper extends an episode indefinitely with continuing related services, so we separately considered episodes closed in: (a) 1 day, (b) within 30 days, and (c) those extending beyond 30 days. In a nested model, we focused on lead physician 'effects,' controlling for patient characteristics. **Results:** Of the total episodes, 78% closed in 1 day, 19% closed in 2 to 30 days, and 3% took > 30 days. One-day episode costs were most stable (mean cost = \$77, coefficient of variation (CV) = 0.36), followed by 30-day episodes (mean cost = \$181, CV = 0.56), and longer than 30-day episodes (mean cost = \$268, CV = 0.78). Among 1-day episodes, 21% of the PCP-years (with 166 unique PCPs) had costs significantly below the average. Only 22% of the episodes of these PCPs extended beyond 1 day vs. 32% for all other PCPs ($P < 0.01$), and the costs of their longer episodes averaged \$176 vs. \$205 ($P < 0.01$). Among the 91 PCPs with 2 or more years of significantly lower 1-day costs, 85% (77 PCPs) did not have elevated rates of longer episodes or significantly above average costs for longer episodes. **Conclusions:** Focusing on 1-day acute bronchitis episodes (78% of the total) markedly reduces the variance across episodes, but substantial variation in episode costs across PCPs remains. With some PCPs repeatedly achieving low 1-day costs without evidence of subsequent problems, episode-based payment may lead to improved resource use.

Keywords: Episode-based payment; Cost

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D4-1:

Economic Impact of an Evidence-based Standardized Perinatal Care and Practice Measurement Process: Evidence from a U.S. Integrated Healthcare Delivery System

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Background/Aims: Recent estimates indicate 10-15% of all babies born in the U.S. are admitted to the neonatal intensive care unit (NICU) which along with evidence that coordinated prenatal care is positively correlated with better birth outcomes (fewer low birth weight and premature babies, and fewer infants transferred to NICU's) suggest the potential for improvement in perinatal care quality and cost. The aim of this analysis is to examine the economic impact of an evidence- and guideline-based standardized coordinated perinatal care and electronic health record measurement process (Geisinger Health System (GHS) Perinatal ProvenCare® (PPC)) for both the mother and infant implemented in a large integrated U.S. healthcare delivery