Mulholland Mohler Residents Meeting – May 10, 2018

ORAL RESEARCH PRESENTERS

1. **Dr. Sonal Gandhi** GBMC	Repetition of Rare CPOE Orders Estimates Rate of Orders Placed on Wrong Patient: Validation of a Tool for Study and Intervention
2. **Drs. Pranav Patel -Zain Gowani** Hopkins/Bayview	The Diagnosis of ACS: Utilization of Troponins
3. **Dr. Aline Camargo** MedStar/Harbor	Sepsis and Altered Mental Status: The Value of CT Imaging
4. **Dr. Rachit Vakil** Hopkins/Broadway	The Association of Baseline ST Point Elevations and Mortality: Results from MESA and ARIC
5. **Dr. Anum Asif** St. Agnes Hospital	Psychosocial and Spiritual Assessment of Patients with Congestive Heart Failure
6. **Dr. William Yang** Hopkins/Bayview	Post-Myocardial Infarction Recovery Through MHealth: Expanding Access with Loaner Smartphones
7. **Dr. Brittany Duchene/ Dr. David Blackwood** MedStar HHC	The Effects of Verbal Cam-ICU Reporting in Academic Rounds on ICU Patient Mortality and Length of Stay
8. **Dr. Clare Coda** UMMS/VA	Improving Advance Directive Rates in a Resident Practice

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- **( ) Clinical Research**

Indicate your participation in research process (4 sentences or less):

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REPETITION OF RARE CPOE ORDERS ESTIMATES RATE OF ORDERS PLACED ON WRONG PATIENT: VALIDATION OF A TOOL FOR STUDY AND INTERVENTION.

PURPOSE: Extraordinary attention has been focused on ensuring that at the bedside the correct patient receives ordered medications and procedures. In contrast, the two dominant electronic record systems in Baltimore have both pursued efficient physican order entry (CPOE) where patient identity verification is largely passive. Several patient complaints led us to informally survey residents, who reported that CPOE ID errors occur several times weekly. In search of a proxy indicator, we hypothesized that the rate of CPOE orders, usually applied rarely, written twice in quick succession with different patients would correlate with ID errors. Such a tool could give us insight into the epidemiology of and impact of interventions on CPOE patient ID error.
METHOD: After IRB approval, a database of all CPOE orders placed in Epic in a single hospital between October 2016 and February 2018 was created. Orders were organized into physician – order pairs, and sorted by frequency per day. 100 orders with a physician specific use rate of less than once in 10 days but which were repeated within 48 hours were chosen randomly. The corresponding repeated order served as one control. 100 orders of equal rarity but not repeated served as a second control. The orders were randomized and each underwent chart review by three of 12 blinded reviewers to identify orders that with high certainty were not appropriate for the patient's diagnoses and not mentioned in their plan for the day.
RESULTS: 1.6 million orders included 685 thousand sufficiently rare orders. Of these, 5623 orders were repeated. 7% of the index sample were found inappropriate by all 3 reviewers vs 1% of the follow up orders and control groups (χ^2 test, P <0.05). All of which statistically and logically supports the hypothesis. Overall, the tool suggests a rate of .058% definitive order errors with a potential rate as high as 0.8%. Assuming that rare orders have an ID error frequency no higher than that seen with common orders, the tool implies that between 1000 and 10,000 orders were placed on the wrong patient in the study period. It is likely that a majority of these were detected by other safety measures, but nevertheless the residual 100's of orders certainly burdened our patients with cost and potential iatrogenesis. The rate increases with experience and is similar across all physician categories.
CONCLUSIONS: Even with the most conservative assumptions, the validated tool uncovers extraordinary latent risk in our current CPOE design. It establishes a logical standard to assess contributing factors and assess strategies for amelioration. This tool should be straightforward to apply to alternate institutions and electronic systems.

Program Director's Name: Paul Foster MD

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THE DIAGNOSIS OF ACS: UTILIZATION OF TROPONINS

Purpose: The elimination of inappropriate cardiac biomarker testing for the diagnosis of acute coronary syndrome (ACS) can improve value for our health care system. The Universal Definition of Myocardial Infarction, an accepted guideline of cardiac biomarker use, specifies that troponin is the preferred biomarker for the diagnosis of ACS and should not be evaluated more than two times within the first 3-6 hours unless the timing of symptoms are unclear or ischemic cardiac symptoms recur. For most patients suspected of ACS, no more than three troponins drawn within 24 hours are necessary to make an ACS diagnosis. In this study, we sought to evaluate the number of instances in which patients received more than three troponins during their inpatient admission or ED visit.

Methods: A total of 2,898 adult inpatient admissions and 18,098 emergency room visits were evaluated for the specific diagnoses of acute myocardial infarction, acute coronary syndrome, NSTEMI, unstable angina, or chest pain. In each of these cases, we evaluated whether greater than three versus three or less troponins were ordered during the inpatient admission or ED observation period. All patients who were admitted from the ED were grouped as inpatient admissions. Data was reviewed from January 2016 -December 2017 at four institutions: Johns Hopkins Bayview Medical Center, Howard County General Hospital, Sibley Memorial Hospital, Suburban Hospital. There was additional data available for The Johns Hopkins Hospital from January 2016 – September 2016 and January 2017 –December 2017. We estimated the changes in charges using the average charge per troponin ($51.90) obtained from administrative billing data.

Results: During this study period, a total of 1613 (55.7%) inpatient admissions and 626 (3.4%) emergency room visits had more than three troponins ordered. For the inpatient admissions, over 50% of these instances occurred on a core internal medicine service. Overall, 2227 patients had more than three troponins ordered during their admission or ED visit, with an average of 5.34 troponins ordered for each patient. We estimate that the practice of ordering more than three troponins during inpatient admissions and/or ED visits produced an additional $618,025.20 in patient charges.

Conclusions: At four hospitals within our health system, over a course of two years, more than half of all inpatient admissions for the diagnosis of ACS had potentially excessive use of troponins. Interestingly, most of these cases occurred on an inpatient medicine service. We believe this represents a significant opportunity to promote high value care by reducing inappropriate cardiac biomarker utilization within our health system.

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SEPSIS AND ALTERED MENTAL STATUS: THE VALUE OF CT HEAD IMAGING

Introduction
Head CT is frequently ordered on critically ill patients with altered mental status. We evaluate the usefulness of non-contrast head CT (NCCT) ordered for critically ill intensive care (ICU) patients diagnosed with sepsis and/or altered mental status (AMS) and the impact of the imaging on management.

Methods
We searched our institutional Radiology Information System for NCCT imaging on ICU patients with indications that included variations of "sepsis" and "AMS." Imaging reports were reviewed for positive findings, defined as new findings that could account for the patients' symptoms. Chronic changes such as old infarction, arteriolosclerosis, or cerebral atrophy were not considered positive studies. Subsequent diagnoses were ascertained via review of electronic medical records and imaging order requisitions.

Results
56 patients with sepsis and 145 patients with AMS (without sepsis) were included. 23/56 patients (41%) with sepsis also had AMS and 4/23 (17.4%) of these had positive
findings. For the other 33/56 patients (58.9%) with sepsis but without AMS, 4/33 (12.1%) had positive findings. Medical management was changed in 2 of these 8 patients (2/8 =25%, 2/56 = 3.6%). Of 145 AMS patients without sepsis, 13 (8.9%) had positive findings. Management changed in ten of these thirteen (76.9%) patients. Thus, 21 AMS patients had positive findings (21/201 = 10.4%); 12/21 (57.1%) had a management change.

Discussion
Practicing cost-effective medicine is a major emphasis for medical organizations. We found that among critically ill patients in the setting of sepsis or AMS positive CT head findings were found in 10% of patients with over half leading to management changes. These results can help suggest appropriateness criteria for head CT imaging in these patients. Identifying patient characteristics that increase these percentages may prove useful in optimizing utilization and creating ideal guidelines.

Conclusion
Brain CT appears to be a cost-effective study for critically ill patients with AMS and sepsis.

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Title: THE ASSOCIATION OF BASELINE ST POINT ELEVATIONS AND MORTALITY: RESULTS FROM MESA AND ARIC

Authors: Rachit M. Vakil, MD (ACP Member), David Tian, MD, Yiyi Zhang, PhD, Eliseo Guallar, MD, Elsayed Z. Soliman, MD, Susan R. Heckbert, MD, Gordon Tomaselli, MD, Wendy Post, MD, David A. Bluemke, MD, Leonard Ilkhanoff, MD, Joao Lima, MD, Moyses Szklo, MD, Saman Nazarian, MD

Purpose: Prior studies suggest that ST elevation at the J-point is associated with elevated risk of death. We sought to examine the prevalence and prognostic importance of elevation at various ST points in a large multi-ethnic population.

Methods: After confirming data harmonization, we combined ECG, demographics, and mortality data for 19,578 participants from the Atherosclerosis Risk in Communities Study and the Multi-ethnic Study of Atherosclerosis population-based cohorts. The average age at baseline was 56.1 ± 8.1 years and 56.2% of the participants were female. Participants were stratified by the presence of ≥ 1 mm inferior (0.5%), lateral (27.8%), inferior or lateral (29.3%), and inferior and lateral (0.2%) ST elevation (at the J-point, mid-point, 60ms after the J-point, and end-point). We utilized models adjusted for age, gender, ethnicity, source cohort, BMI, education, heart rate, hypertension, left ventricular hypertrophy, smoking status, diabetes, LDL, HDL, and aspirin and/or statin therapy.

Results: Inferior ST elevation at any ST point was associated with increased mortality (HR 1.94, 95%CI 1.32 - 2.84). In contrast, lateral elevation at any ST point was associated with decreased mortality (HR 0.88, 95%CI 0.81 – 0.95). ST-end elevation was more common and drove the association of lateral elevation with decreased mortality. The magnitude of association between inferior ST elevation and increased mortality was strongest when occurred at the mid-ST or J-points. Although the prevalence of elevation varied among subgroups, no additive or multiplicative interactions were noted with gender or ethnicity.

Conclusions: We found that asymptomatic inferior lead ST elevation is uncommon and is associated with elevated risk of mortality regardless of ethnicity. In contrast, asymptomatic lateral ST elevation at the ST-end point is common and is associated with lower risk of mortality.

Co-Author(s) Associates: Vakil RM, Tian D, Zhang Y, Guallar E, Soliman EZ, Heckbert SR, Tomaselli G, Post W, Bluemke DA, Ilkhanoff L, Lima J, Szklo M, Nazarian S

Program Director's Name: Sanjay Desai, MD

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- Review of data
- Research paper writing

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Program Director's Name: Sapna, Kuehl M.D.

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Psychosocial and Spiritual Assessment of Patients with Congestive Heart Failure (CHF).

Background:
Clinical evidence suggests that major depressive disorder (MDD), generalized anxiety disorder (GAD) and spiritual distress (SD) adversely affect prognosis in patients with chronic medical diseases. Clinicians often do not include psychosocial and spiritual assessments for a variety of reasons, including time constraints in dealing with the more apparent physical needs of the patients. The goal of this study was to determine the presence of and potential impact on quality of life of psychosocial and spiritual distress (PSSD) in patients followed at the Congestive Heart Failure Center (CHFC) at our hospital.

Methods:
This is a retrospective study of 169 consecutive patients attending the CHFC from 2015-2016. Data analyzed were: clinical records, two single-paged questionnaires, Minnesota Living Heart Failure Questionnaire (MLHFQ) and chaplain's assessment. The questionnaires were PHQ-9 and GAD-7 with nine additional spiritual and social assessment questions based on Duke University spiritual data. Score of $\geq$ 10 on PHQ-9 and GAD-7 defined MDD and anxiety respectively. Spiritual distress was assessed by four spiritual assessment questions and chaplain's interview. The data were subsequently analyzed statistically.

Results
The study population consisted of 169 patients (age range 29-94 years; 93 men and 76 women) with CHF (NYHA Class II-IV). PSSD was frequently present: MDD (33.94% out of 165) and GAD (21.5% out of 167) and interestingly was often untreated (23.6% of MDD on anti-depressants and 14.3% GAD on anxiolytics). Differences in SD detection by questionnaire (30 of 169; 18%) compared to chaplain's assessment (19 of 90; 21%) were expected, since chaplain used the HOPE method, focused on broader spirituality issues, whereas the questionnaires were narrowly focused on religious struggle. Patients with SD by questionnaire were younger ($p<0.034$) as compared to non-distressed patients. Poor quality of life (QoL) correlated with MDD ($r=0.508$, $P < 0.001$), GAD ($r=0.531$, $p < 0.001$) and spiritual distress ($r= 0.211$, $p < 0.01$). The MLHFQ results showed correlation of MDD, GAD and SD with both emotional (e.g. worry) and physical (e.g. difficulty performing work) distress.

Conclusion: Our data suggest a substantial degree of PSSD is present, often undetected/untreated and potentially may adversely impacts QoL in patients at the CHFC. We urge the assessment for and treatment of PSSD in patients with CHF.

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Indicate your participation in research process (4 sentences or less):
I have served as the Clinical Technology Specialist on the Myocardial infarction COmbined-device Recovery Enhancement (MiCORE) study since my intern year in 2016. I have participated in various roles on this dynamic interdisciplinary team, the most notable of which have been designing, operationalizing, and studying the smartphone loaner program, spearheading efforts to place Apple TVs in patient rooms to allow AirPlay of the Corrie app, and exploring EHR and Corrie integration.

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POST-MYOCARDIAL INFARCTION RECOVERY THROUGH MHEALTH: EXPANDING ACCESS WITH LOANER SMARTPHONES

Purpose: Develop a prescription-strength digital health intervention ("Corrie") aimed at re-engineering hospital discharge and reducing hospital readmissions in myocardial infarction patients. Evaluate the feasibility of delivering Corrie on loaner smartphones and compare 30-day hospital readmissions with patients using Corrie on their personal smartphone.

Methods: We conducted a prospective observational study of acute myocardial infarction patients hospitalized at Johns Hopkins Hospital and Johns Hopkins Bayview. Eligible patients were enrolled in the Myocardial infarction COmbined-device Recovery Enhancement (MiCORE) study. Participants who owned a compatible iPhone were provided access to the "Corrie" app while others were provided a loaner iPhone ("iShare") preloaded with Corrie. All participants were loaned an Apple Watch. Readmissions at 30 days post-discharge were assessed by reviewing the electronic health record and surveying patients.

Results: Of 79 participants (age 33-81, mean 58; 70% men), 3.8% (n=3) were readmitted within 30 days compared to a 19% risk-adjusted rate for acute myocardial infarction patients at Johns Hopkins Hospital, which represents an estimated cost savings of $344,000 in readmissions penalties. None of the readmissions were for cardiac reasons, though one was for a non-cardiac complication of CABG. A total of 40 (51%) participants were iPhone owners (age 33-81, mean 59; 78% men), and 39 (49%) were iShare users (age 37-80, mean 57; 62% men). Of iPhone owners, 2.5% (1/40) were readmitted within 30 days. Of patients with iShare phones, 5.1% (2/39) were readmitted, and 67% (26/39) returned their equipment, enabling reuse by a future patient. Equipment replacement cost is estimated at 2% of readmissions penalties saved.

Conclusions: Patients using Corrie were readmitted to the hospital at a lower rate than the institutional mean whether they owned or were loaned an iPhone. The loaner smartphone model enables teams to concentrate development efforts on a single smartphone platform, while maximizing the number of patients enrolled.

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Indicate your participation in research process (4 sentences or less):

David Blackwood participated in the collection and analysis of patient data, including but not limited to apache scoring, sedation, intubation and line data collection and the synthesis of the abstract and article.

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THE EFFECTS OF VERBAL CAM-ICU REPORTING IN ACADEMIC ROUNDS ON ICU PATIENT MORTALITY AND LENGTH OF STAY

Purpose
Delirium has been established as an independent risk factor for prolonged hospital length of stay (LOS) and is a significant contributor to increased morbidity and mortality in the hospitalized patient. Nursing documentation of CAM-ICU (confusion assessment method-intensive care unit), a validated tool for assessing delirium, is standard of care. This study aims to elucidate the effects on hospital mortality and LOS when the CAM-ICU is verbally reported during academic physician ICU rounds.

Methods
This is a single center retrospective observational study of 279 adult ICU patients, who were admitted for at least 12 hours, over a one-year period (July 2016-July 2017). The CAM-ICU statuses of 144 patients were verbally reported during academic ICU rounds (reporting group) and 135 patients did not have their CAM-ICU status verbally reported (non reporting group). The hospital mortality and LOS between these groups were analyzed using binary logistical regression, Student's T-test and Chi-squared test as appropriate.

Results
Correcting for age, gender, APACHE II score, and admission diagnosis, the hospital mortality rate of the CAM-ICU reporting group was 7% lower than those in the non-reporting group (32.6% vs 25.7%, p=0.040; OR=1.92). LOS was not statistically different between groups, however, the reporting group had a mean LOS 0.8 days less than in the non-reporting group (6.13 days vs 5.27 days, p=0.595). Post-hoc analyses revealed decreased hospital mortality in those admitted for neurological causes in the reporting group (61.5% vs 38.5%, p=0.036). When analyzing subgroups of APACHE II scores, those admitted with an APACHE score between 11-20 had significantly lower hospital mortality in the reporting group (40.7% vs 23.5%, p=0.038). Finally, subgroup analysis of LOS found that the reporting group had significantly lower hospital mortality if their LOS was between 6 and 10 days (73.4% vs 28.6%, p=0.007).

Discussion
Verbal reporting of CAM-ICU status during academic rounds decreases all-cause hospital mortality and may lead to decreased hospital LOS. Delirium is complex and there may be specific subgroups of patients who will benefit the most from verbal reporting of their CAM-ICU status.

Conclusion
Verbal CAM-ICU reporting is a cost-effective and noninvasive intervention that has potentially considerable benefits for ICU patients and the healthcare system as a whole.

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Indicate your participation in research process (4 sentences or less): Project organization, clinic implementation, data review

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IMPROVING ADVANCE DIRECTIVE RATES IN A RESIDENT PRACTICE. **Coda C, MD, Beck B, Millstein L, MD, Baek D, MD. The University of Maryland Medical Center and Baltimore VA Medical Center, Baltimore, MD.**

Background: There is a growing need for and emphasis on advance directives (ADs) and end-of-life care planning. Internal Medicine residents are often not specifically trained in ADs and experience multiple barriers to successful completion of AD documents with patients. We sought to improve resident comfort and ability in this process through an interdisciplinary, patient-centered educational approach.

Methods: Residents assessed their comfort level and self-efficacy in discussing ADs on a 100 point confidence scale before and after our intervention. The intervention was two steps. First residents reviewed an educational PowerPoint designed to increase knowledge and comfort with ADs. This was followed by participation in an interdisciplinary visit at an internal medicine resident continuity clinic with a patient, members of the patient's family, and a licensed clinical social worker (LCSW). The visit was to discuss, implement and document an AD with the patient. Each participant completed an evaluation of the resident's competency after the visit.

Results: To date, 13 residents have completed the interdisciplinary session, with an anticipated total of 36 participants. Residents' self-identified comfort level had a statistically significant increase in 10 of 12 categories ($p < 0.05$). The largest gains were in comfort with scheduling patients for AD planning (52 pre, 77 post, $p=0.0002$) and allocating time to discuss AD in clinic (46 pre, 67 post, $p=0.0019$). Pre-intervention, more past training correlated with higher mean comfort levels in AD discussion (79 pre, 87 post). Residents with less training reported greater mean gains post-intervention (56 pre, 71 post). A lower mean comfort level on the pre confidence scale did not reflect inability to demonstrate AD skills in the interdisciplinary session. All residents (n=13) demonstrated sufficiently expected/average skills when evaluated by the LCSW after each session.

Discussion: An interdisciplinary, patient-centered curriculum implemented in an internal medicine resident continuity clinic resulted in improved resident self-efficacy and comfort level in AD management. Interdisciplinary AD visits helped residents gain insight into their patients' understanding of ADs, provided patients with a positive experience with their primary care physicians, and gave residents the opportunity to incorporate a LCSW into their practice.