

Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

1B

TECHNIQUES FOR IMPROVING QUALITY OF MEDICAL CARE

Session Moderator: Eric Seibel, Mechanical Engineering

MGH 228

12:30 PM to 2:15 PM

* Note: Titles in order of presentation.

Availability of Common Pediatric Radiology Studies: Are Rural Patients at a Disadvantage?

Shruthie Gnaneswaran, Senior, Biochemistry

Molly Sarah (Molly) Thach, Senior, Biochemistry

Mentor: Kathleen Kieran

Although increasing utilization of outreach clinics has increased accessibility to subspecialty care for pediatric patients, the availability of pediatric urologic imaging in local settings has not been previously described. We undertook this study to describe the availability of common radiographic tests ordered by pediatric urologists, and to determine if availability disparities exist between urban and rural locations. We identified 88 freestanding hospitals in Washington and contacted via phone survey asking whether they offered flat plate abdominal X-rays (AXR), renal-bladder ultrasounds (RBUS), voiding cystourethrograms (VCUG), MAG-3 renal scans, and nuclear cystograms (NC) to pediatric patients. 74 institutions (84.1%) completed the survey; 17 (23.0%) were rural (population <2500), and 25 (33.8%) were in urban areas (population >50,000). 73 (98.6%) institutions offered AXRs, 68 (91.9%) offered RBUSs, 44 (59.5%) offered VCUGs, 26 (35.1%) offered MAG-3s, and 15 (20.3%) offered NCs to children. The availability of AXRs (100% versus 96%, $p=0.88$) and RBUSs (70.6% versus 96%, $p=0.15$) was similar in rural and urban settings, while VCUGs (11.8% vs 72%, $p=0.001$), MAG-3s (5.9% vs. 60%, $p=0.006$), and NCs (0% vs 44%, $p=0.017$) were more commonly available in urban settings. Rural hospitals were less likely to employ in-person radiologists (35.3% vs 96%, $p<0.0001$) or offer sedation (6.3% vs 36%, $p=0.01$) during testing, but were equally likely to offer child life (0% vs 20%, $p=0.28$) and to have age restrictions on the tests offered (17.6% vs 40%, $p=0.50$). Fellowship-trained pediatric radiologists were employed exclusively in urban settings (16% vs 0%, $p=0.39$). Our findings portrayed that rural Washington state hospitals have less access to radiographic tests and are promoted by broad radiographic procedures that are not specialized to the individual pediatric patient. These results bring forth a future set of cri-

teria for each Washington state hospital in how they treat pediatric patients with more inclusive treatment plans.

Clinical Characteristics of Primary Bocavirus in Infants in Rural Nepal

Micaela Sara (Micaela) Haglund, Senior, Psychology

Mentor: Helen Chu, Allergy & Infectious Diseases

Pneumonia is a leading cause of infant mortality worldwide, with a disproportionate burden of disease in resource-limited settings. Bocavirus is a newly described respiratory virus that may be associated with pneumonia in infants. We aim to define the risk factors and burden of disease associated with bocavirus infection in infants in rural Nepal. Identifying risk-factors could direct us in future research and help improve our current prevention methods in resource-limited settings. Currently, with unknown risk factors, prevention techniques may not be effective leading to unnecessary cases of bocavirus infection. In a home-based active weekly surveillance study of acute respiratory infections in infants up to six months of age, we find that 292/3646 had a symptomatic illness due to bocavirus. We aim to identify the risk factors, including low birthweight, preterm birth, and household crowding that may be associated with increased risk of bocavirus, as well as to describe the clinical and virologic characteristics of primary infection in infants in a resource-limited setting.

Decision Regret in Patients with Durable Ventricular Assist Devices

Cole Evans (Cole) Hansell, Senior, Biology (Physiology)

Undergraduate Research Conference Travel Awardee

Mentor: Stephanie Cooper, Medicine/Cardiology

Mentor: James Kirkpatrick, cardiology, ethics

Patients undergoing ventricular assist device (VAD) therapy are by definition very sick and typically told that they have a high likelihood of dying in the next year without VAD therapy. Though most patients have improved functional status

and quality of life, repeated hospitalizations and potentially catastrophic complications post implant can be burdensome. The research aims to assess for decisional regret or ambivalence about VAD implant. During a 3 year program all post VAD implant patients were referred to palliative care. Patients were administered a 5 question decision regret survey that correlates well with decision satisfaction and decisional conflict. On a scale of 0-100, scores >25 were considered to reflect significant ambivalence, and scores between 10-25 were defined as mild ambivalence. Patients were also administered the PHQ-9, a tool for depression inventory. The results found that 102/129 (79%) patients completed decision regret surveys. 64/102 (63%) scored 0, 7/102 (7%) scored >25, and 29/102 (28%) scored between 10-25. The average age of the patients scoring >25 was 44, compared to 55 of the whole cohort. Of those that expressed some degree of ambivalence (n=36), 11/36 (31%) met criteria for at least moderate depression, compared with 18% for the whole cohort. 26% of the total cohort had VADs as bridge to transplant (BTT), while 13/29 (44%) ambivalent patients and 4/7 (57%) very ambivalent patients were living with their VAD as BTT. A majority of patients do not regret their decision; however, a significant minority expressed mild ambivalence, and a small number expressed significant ambivalence. Ambivalence was more common in those who are younger, those with VAD as BTT, and in patients with depression. It is important to recognize pre-implant that patients have different decision-making needs, and that managing their expectations may be a key component of helping them to adjust post VAD.

Improving Accuracy of At-Home, Preventative Oral Health Care through Customized Teeth Models

Hae In (Angel) Lee, Junior, Computer Engineering
Mentor: Eric Seibel, Mechanical Engineering

Recent technology introduced by Phillips Sonicare attempts to address the challenge of improving at-home, preventative oral health care for children by providing users encouragement and guidance on how and where to brush based on rough estimations that are visually represented to the client on a general, perfect teeth model. Although this innovation is a step towards empowering individuals to improve their oral health from information outside dental clinics, there are limitations to the actual improvement that can be made due to its implementation. By combining and creating new tools that will work with advanced intraoral cameras, I intend to take the next step in improving at-home, preventative care through a design that will be more personal and accurate than any existing one. More specifically, my goal is to develop software that can create personalized teeth models, representative of the user's teeth. Through a series of manipulating a perfect, 3D animated teeth model from Animum, I examine the object files, which are 3D model files, treating them as text files and observe how they change for a specific edit through a

3D model editor such as Autodesk 3ds Max. These observations are used to create general algorithms for a specific edit which is combined into a program that can generate personalized teeth models, such as missing or crooked teeth. With a more personal model, the users are more accurately guided to a specific lesion on their teeth, resulting in more effective application of medicinal therapies and optical monitoring of healing.

The Role of Socio-Geographic Factors in Recovery after Thoracic Surgery among Rural and Urban Populations

Aneasha J. (Aneasha) Morris, Junior, Biochemistry

Mentor: Stephen Kaplan

Mentor: Richard Thirlby

Mentor: Michal Hubka

Social determinants of health are non-biologic factors that can strongly influence individual health status, healthcare access, and disease vulnerability. While this subject is well studied, limited data exists on the influence of these social factors on surgery, and more specifically, recovery after surgery. The burden of surgical disease remains taxing globally and disproportionately affects marginalized populations. Due to the limited access to higher level surgical care, patients often travel from eastern Washington and various other rural areas to Virginia Mason Medical Center for cardiothoracic procedures. Through this study I aim to identify social-geographic factors that contribute to this burden, and determine the discrepancies that generate variances in recovery. I hypothesize that among patients undergoing thoracic surgery at Virginia Mason Medical Center, distance from Seattle will be associated with measures of recovery in the postoperative period. I quantify the postoperative recovery of patients by measuring length of stay, postoperative complications, and readmission. Due to the burden of transport, inconvenience, missed work, increased personal costs, and other socioeconomic issues, I expected to see slower recovery, and possibly greater complications among patients coming from further distances. By first characterizing the problem, I then identify unique challenges that arise among various demographics of patients, creating a tailored perioperative education. This optimizes clarity in communication of postoperative planning and potential complications to create an improved set of guidelines, specified towards particular demographics of patients.

Physician Assessment of Blinded Adverse Events in Randomized Controlled Trials in Cystic Fibrosis

Madeline (Maddy) Wessels, Senior, Computer Science

UW Honors Program, Undergraduate Research

Conference Travel Awardee

Mentor: Christopher Goss, Medicine and Pediatrics

Adverse Events (AEs) are detrimental medical incidents in a research participant that may or may not be related to the

investigational agent. During clinical trials, physicians are required to document attribution of AEs with limited guidance regarding how to assign attribution. The objective of this study was to determine the accuracy of physician based attributions for AEs occurring in cystic fibrosis (CF) patients participating in blinded randomized controlled trials (RCTs). This retrospective study pooled clinical trial data from 4 CF RCTs; all participants who experienced ≥ 1 AE were included. A repeated measures logistic regression model using generalized estimating equations and adjusted for baseline demographic variables (gender, age, CF genotype), comorbidities, and lung function (forced expiratory volume in one second; FEV1). The primary predictor of interest was receipt of study drug versus placebo. The primary outcome of interest was physicians' determination of the AE as related to study drug. Study patients were young with mild lung disease. Receipt of study drug was not significantly associated with the likelihood a physician would deem an AE to be related to study drug. However, we found significant associations between age, gender, and FEV1 and our outcome of interest— presence of an AE felt by a physician to be related to study drug. These findings suggest a biased assessment of physician attribution. Physician assessment of relatedness in RCT's is a key requirement per the Food and Drug Administration (FDA). We found no significant association between AEs coded as related to study drug and actual study drug receipt. Interestingly, we found other associations implying an intrinsic bias in physician assessment based on age, gender and disease severity. Further research may clarify whether changes are needed to current FDA guidelines.