Variables Associated with Intracardiac Thrombus during Orthotopic Liver Transplant: A Retrospective Single-Center

Breanna Aldred

BACKGROUND: Intracardiac thrombus (ICT) is a complication during orthotopic liver transplantation (OLT) with a high mortality. End stage liver disease patients have compromised coagulation pathways and when combined with the stressors of transplant surgery, thrombi can form. These thrombotic events not only directly impact the patient undergoing the operation but also indirectly affect the patients on the liver transplant wait list as a viable graft is potentially lost. Despite the lethality ICT, few studies have been done to investigate what donor, recipient and intraoperative characteristics are associated with such events.

OBJECTIVE: This study identified the incidence of and risk factors associated with intraoperative ICT during OLT at the University of Wisconsin Hospital.

METHODS: Retrospective review of electronic anesthesia records identified liver transplant recipients who developed intraoperative ICT from 2010 to 2017. Potential risk factors were analyzed using Fisher’s exact tests or chi-squared tests for categorical data and independent t-tests for continuous data. Logistic regression was used to further analyze the data.

RESULTS: The incidence of ICT during OLT at this institution is 4.17% (22/528), with a 45.45% (10/22) mortality. Patients who developed ICT had higher physiologic MELD scores at the time of transplant (25.1 vs. 32.4, p=0.003) and lower preoperative fibrinogen levels (174.6 vs. 141.0, p=0.031). They also received grafts from donors with higher BMIs (28.1 vs. 32.2, p=0.005). Lastly, administration of IV heparin prior to inferior vena cava (IVC) cross-clamping was associated with a lower risk of developing ICT [OR=0.249 (0.083-0.746)]. Frequently suggested risk factors such as the administration of antifibrinolytics and baseline thromboelastography were not associated with ICT.

CONCLUSIONS: The incidence of ICT at our institution is higher than previously reported incidences, though the mortality rate is lower. This may be explained by our routine use of transesophageal echocardiography which allows thrombi to be diagnosed earlier, leading to faster treatment. While many characteristics associated with increased risk of ICT in this study are non-modifiable, administration of IV heparin prior to IVC cross-clamping was found to be protective. Further studies will be needed to confirm risk factors associated with ICT to aid in risk stratification and ultimately prevent these potentially lethal events.
Maximum Diameter is a Poor Surrogate Measure for Volume of Small Pancreatic Cysts

Adam Awe

BACKGROUND: Indeterminate pancreatic cysts (PCs) are often difficult to accurately and reproducibly characterize and monitor over time using maximum axial diameter (MAD). PCs are often non-spherical, and MAD metrics may not accurately risk-stratify patients nor capture the evolution of PCs.

OBJECTIVE: The aim of this study is to determine whether MAD is an appropriate surrogate measure for PC volume.

METHODS: We conducted a single-institution retrospective analysis of patients with radiologically confirmed PCs ≥1cm on a contrast-enhanced CT or MR scan. Patients with two scans ≥1 year apart were included in rate of change analyses. MAD, volume, and sphericity data were collected using HealthMyne, a novel lesion detecting software. Pearson’s correlations were determined between volume and MAD overall and with size groupings from the Fukuoka PC Guidelines criteria. The absolute value of the percent difference of volume change was calculated using the MAD-dependent volume estimation and measured volume and were stratified by high and low PC sphericity and compared by chi-square analysis.

RESULTS: In total, 202 patients were included in the volume to MAD correlation analyses. PC MAD ranged from 1.0-7.5cm and volume from 0.3-104.3cm³. PC volume as a function of MAD overall had a strong correlation (r=0.94). When grouped by Fukuoka criteria size, correlations varied: r=0.78, 0.53, and 0.90 for 1-2cm (n=87), 2-3cm (n=61), and ≥3cm (n=54) PCs, respectively. Based on volume alone, 95 cysts (47%) overlapped Fukuoka size groups. A subset of 153 patients were included in the rate of change analyses. The average change in MAD/year was 1.0mm/year (SD 2.5mm/year) and volume/year was 0.88 cm³/year (SD 2.5 cm³/year). For 60 (39%), the actual volume change was larger than the estimated volume change based on MAD, and 64 (42%) had a >100% absolute difference in volume change between estimated and actual volumes. PCs with high sphericity (≥0.80) had greater concordance between estimated and actual volume changes (p=0.02).

CONCLUSIONS: Despite an overall strong correlation between PC volume and MAD, grouping PCs based on Fukuoka criteria size reveals poor volume to MAD correlation for small cysts. MAD also poorly predicts changes in volume for pancreatic cysts, particularly for PCs with low sphericity. Overall, these findings suggest that volume may be a useful adjunct metric to characterize and follow smaller PCs.
The Impact of Diagnosis on Patient Satisfaction Scores in a Large Sample of General Surgery Outpatients

Nadeem Bandealy

**Background:** While demographic and other patient-related factors are known to impact patient satisfaction, the role of disease-related factors, specifically primary diagnosis, is not well studied.

**Objective:** We aimed to determine if primary diagnosis affects satisfaction scores in the surgical outpatient setting.

**Methods:** Primary diagnosis was examined in relation to patient experience scores as reported in Medical Practice Survey responses of general surgery patients seen in an outpatient setting from July 2016-2018. Diagnoses with similar presentations, treatments, and prognoses were merged into groups prior to viewing survey results. Chi squared univariate analyses compared the percentage of top box responses to 1) “Amount of time the care provider spent with you,” 2) “Likelihood of your recommending this care provider to others,” and 3) “Likelihood of your recommending our clinic to others” across patient, clinic, provider, and survey-related variables. Multivariate logistic regression was performed to determine associations with top box responses.

**Results:** Survey results were extracted for 1,262 patients across 6 clinical groups: breast cancer (n=411), benign gallbladder disease (n=83), hernias (n=285), thyroid/parathyroid hormonal disorders (n=161), and hormonally inactive thyroid masses and cancer (n=225). On univariate analyses, female patients had higher percent top box scores for questions 1 and 3 (p<0.05). Female providers had higher percent top box scores for questions 1 and 2 (p<0.05). Responses to questions 2 and 3 differed by clinic location (p=0.01 and p=0.04, respectively) and by diagnosis group (p=0.001 and p=0.02, respectively). On multivariate analyses, only diagnosis group remained significant for all three questions (p<0.05). Breast cancer patients were more likely to recommend the clinic than patients in all but one diagnosis group (p<0.05). They were also more likely to recommend their provider than the thyroid/parathyroid hormonal disorders group. Clinic location was significant for questions 1 and 3 (p<0.05), but not for question 2.

**Conclusion:** For general surgery outpatients, breast cancer patients have higher satisfaction scores compared with patients with several other examined diagnoses on multivariate analyses, suggesting diagnosis alone may influence outpatient patient satisfaction survey results. Further research is needed in this area, but diagnosis may have a previously under-appreciated impact on patient satisfaction.
Identifying Gaps in Primary Care that Influence Emergency Care Use by Community-Dwelling Patients with Dementia

Aaron Beck

BACKGROUND: The healthcare system serves a growing number of individuals with Alzheimer’s Disease and related dementias. Primary care physicians (PCPs) play an important role in addressing the urgent and emergency care needs of persons with dementia (PwD). However, barriers in primary care exist that influence PwD’s use of acute care services. As a result, PwD frequently receive acute unscheduled care in an emergency department, a sub-optimal environment for this population.

OBJECTIVE: This research aimed to identify PCPs’ unmet needs in caring for and supporting community-dwelling PwD, particularly as they relate to factors leading to patients’ use of emergency or urgent care services.

METHODS: Semi-structured interviews were conducted with dementia care stakeholders to elicit multiple perspectives. A thematic analysis framework was used to iteratively code interview transcripts and develop themes.

RESULTS: We interviewed 27 total stakeholder (61% female, 83% non-Hispanic white): 10 PCPs (Internists, Geriatricians, Family Physicians, Nurses), 4 emergency medicine providers, 3 paramedics, 6 social workers/aging service providers, and 4 informal caregivers. Three overarching themes and 8 sub-themes emerged from the analysis: (1) Barriers to accessing primary care [Sub-themes: (i) organizational barriers, (ii) logistical barriers, (iii) relational barriers]; (2) PCPs’ role in providing upstream/preventative care to help PwDs avoid acute problems [Sub-themes: (i) providing caregiver support, education, and resources to prevent crisis moments, (ii) establishing goals of care and preparing for the future]; (3) Skills, knowledge, and access to resources influence PCPs’ ability to address PwDs’ needs [Sub-themes: (i) diagnostic approaches, (ii) additional dementia-related training, (iii) engaging community services and resources].

CONCLUSIONS: These findings provide insight into barriers PwDs and caregivers face in receiving primary and acute care services, through the lens of primary care providers’ unmet needs. In particular, this study highlights gaps in the PCP’s ability to manage PwD and caregiver dementia-related needs relating to access to care, upstream prevention of medical problems, and lack of knowledge about diagnoses, dementia care practices, and available community resources. These results may help primary care practices improve the quality of clinical care for PwD and spur development of future patient-centered interventions.
Background: After thyroidectomy, patients require Levothyroxine (LT4), and it may take years of dose adjustments to achieve euthyroidism. During this time, patients encounter undesirable symptoms associated with hypo- or hyperthyroidism. Currently, providers adjust LT4 dose by clinical estimation, and no algorithm exists.

Objective: The objective of this study was to build a decision tree that estimates LT4 dose adjustments and reduces the time to euthyroidism.

Methods: We performed a retrospective cohort analysis on 320 patients who underwent total or completion thyroidectomies at our institution between 2008 and 2016 and required one or more dose adjustments from their initial postop LT4 dose before attaining euthyroidism. Using the Classification and Regression Tree (CART) algorithm, we built various decision trees from patient characteristics that estimated the dose adjustment to reach euthyroidism. We evaluated tree accuracy with repeated 10-fold cross validation. The most accurate decision tree was developed on a training set of 214 patients, with the remaining 106 patients making up the evaluation set. We compared the accuracy of the decision tree to the actual dose adjustments made by an expert provider and to a naïve system that increased or decreased the dose by 12.5 mcg based on patient TSH.

Results: In our study cohort, an expert provider adjusted LT4 doses, and achieved euthyroidism after one dose adjustment for 156 patients (48.8%), two dose adjustments in 90 patients (28.1%), and three or more dose adjustments in 74 patients (23.1%). The most accurate decision tree was generated using TSH values at first dose change (mean absolute error = 13.0 mcg). In comparison, the naïve system had an absolute error of 17.2 mcg, and the expert provider had an absolute error of 11.7 mcg. In the evaluation dataset (106 patients), the decision tree correctly predicted the dose adjustment within the smallest LT4 dose increment (12.5 mcg) 79 of 106 times (75%, CI = 65% - 82%). In comparison, expert provider estimation correctly predicted the dose adjustment 76 of 106 times (72%, CI = 62% - 80%).

Conclusion: A decision tree predicts the correct LT4 dose adjustment with an accuracy exceeding that of a completely naïve system and comparable to that of an expert provider. Since this tree-based algorithm approximates an expert provider’s accuracy in adjusting LT4 doses, it can assist providers inexperienced with LT4 dose adjustment.
**Biometric Cardiac Organoid for in Vitro Investigation of Cardiac Cell-to-Cell Interactions**

**Sophia Colevas**

**Background:** Approximately 6.5 million people are affected by heart failure in the United States\(^1\). Contemporary therapies that block maladaptive neurohormonal pathways have contributed to the decline in mortality due to heart failure in the last two decades, but these therapies are aimed only at reducing disease progression, without repair of the damaged myocardium. To this end, many cellular therapies have been developed and tested, with limited success in human trials\(^2,3\) despite robust recovery shown in animal models\(^4\). Our group has bioengineered a novel cardiac fibroblast-derived extracellular matrix (CF-ECM) from isolated human cardiac fibroblasts for delivering stem cells to the ischemic myocardium. We hypothesized that seeding human iPSC-derived cardiomyocytes on this CF-ECM will promote myocyte maturity, creating a human-like *in vitro* test environment that can be used to study therapeutic effects and inform clinical trials.

**Methods:** Human iPSC-derived committed cardiomyocyte precursor cells at Day 15 and primary human cardiac fibroblasts in varying ratios were seeded on Synthetax\(^\text{TM}\) coated coverslips and 4 varieties of CF-ECM scaffold. Scaffolds were fixed at Day 7, 14 and 26 and stained with fluorescent antibodies for cardiac troponin, α-actinin, vimentin, fibronectin, and collagen and imaged to determine degree of myocyte maturation, myocyte and fibroblast interaction, and cellular integration into the scaffold.

**Results:** Beating was observed in all samples. Myocytes appeared to be within the folds of the CF-ECM scaffold and elongated with the cardiac fibroblasts along the ridges of CF-ECM. At Day 14, beating was most notable in the control, non-decellularized CF-ECM, and decellularized CF-ECM (non-immobilized). Myocytes formed a syncytium interspersed the cardiac fibroblasts within the decellularized CF-ECM. Myocytes cultured on CF-ECM appeared more elongated and rod-like compared to control. At Day 22, beating was observed in only the Synthetax\(^\text{TM}\), non-decellularized, and decellularized CF-ECM, with decreased beating amplitude across conditions. At Day 26, beating in all culture conditions had ceased.

**Conclusions:** These results suggest that culturing iPSC derived myocytes on CF-ECM promotes maturity. An optimal cell-scaffold construct includes increased myocyte density and potential for myocyte integration. Future work begin experiments to mimic the ischemic myocardium for *in vitro* therapeutic analysis.

**References:**

CT Texture Analysis of Large Renal Cell Carcinoma: Comparing the Performance of Two Texture Analysis Software Platforms in Predicting Histologic Findings and Clinical Outcomes

Leo Dreyfuss

BACKGROUND: Computed tomography texture analysis (CTTA) is a novel technique that analyzes gray level pixel or voxel data from routinely obtained cross-sectional imaging. The data is obtained by delineating a region of interest (ROI) on computed tomography (CT) images with subsequent processing by an advanced software platform that analyzes the quantity and distribution of gray levels in the image. Numerous studies have demonstrated that the distribution of pixels in CT images may be associated with histology or disease response. However, multiple software platforms exist, and little comparison data is available.

OBJECTIVE: To determine how two different software platforms for texture analysis compare in their ability to predict histopathology and clinical outcomes of patients with large (>7cm) renal cell carcinoma (RCC).

METHODS: Texture analysis was performed on raw pre/post contrast multidetector computed tomography (MDCT) images of large (>7 cm) untreated RCC tumors in 141 patients (95 male, 46 female, mean age 60) using two different software programs: TexRAD (Somerset, UK) and Healthmyne (Madison, WI). Metrics obtained from TexRAD include standard deviation (SD), kurtosis, mean gray level and entropy. Healthmyne provides additional advanced metrics that include gray-level co-occurrence matrix (GLCM) entropy, energy, angular second momentum (ASM), correlation, and sphericity. Metrics were correlated with tumor histologic subtype and clinical outcomes.

RESULTS: Volumetric analysis in the portal venous (PV) phase using Healthmyne showed strong associations (P<0.001) between clear cell histology and texture features, including entropy, mean deviation, SD, variance, and GLCM entropy, energy, and ASM. Single slice analysis with TexRAD showed similar associations for SD and entropy. ROC analysis of SD for Healthmyne and TexRAD revealed an AUC of 0.86 and 0.80, respectively. There were statistically significant associations between Healthmyne texture and volume features noted on unenhanced CT with death due to disease (HR, mean=1.09, 95% CI, 1.03-1.15, p=0.004), death from all causes, and disease recurrence.

CONCLUSIONS: Findings from both platforms for texture analysis were significantly associated with histopathologic and clinical outcomes. Future studies will focus on using volumetric analysis with 3D descriptors of tumor size and shape to create a more robust CT characterization of tumors.
BACKGROUND: Surgical coaching is an emerging concept of education and collaboration demonstrated to improve surgical performance, perceptions and attitudes of practicing surgeons. Continued surgical education in low-resource settings remains a challenge due to confounding barriers of access, resources, and sustainability. Despite early successes of surgical coaching in academic institutions, to our knowledge, no formal assessments of coaching as a means to improve surgical quality in low-middle income countries (LMICs) exist.

OBJECTIVE: The purpose of this review is to explore if surgical coaching is an effective method of fostering continued medical education and promoting advancement of surgical skills for established surgeons in low resource settings.

METHODS: We conducted a systematic literature search through PubMed, Scopus, Web of Science, and CINAHL in July 2018. Included studies were in English, peer-reviewed, and met pre-established study criteria. Studies must have assessed surgical coaching- specifically defined as a means to establish continuous professional growth of trainees and practicing surgeons. Additionally, we conducted a reference and citation analysis as well as a data quality assessment on included studies.

RESULTS: Our search produced 1377 results and 151 were selected for full text analysis, of which 23 met inclusion criteria for summary analysis. While the majority of the articles (13/23) evaluated coaching of trainees, 10 articles assessed or evaluated coaching surgeons in established careers. Of the articles that discussed skill acquirement (18/23), 3 assessed non-technical skills alone, and 15 assessed technical skills or both technical and non-technical skills. In studies that assessed skill performance after a coaching intervention (9/23), all of them (9/9) demonstrated skill improvement compared to a control. The idea of remote or cross-institutional coaching was explored in 8 of the 23 studies. None of the studies reviewed discussed or evaluated coaching in LMICs.

CONCLUSIONS: Coaching is a widely applicable method of teaching surgeons at multiple stages of a career with clear educational benefits. The explored advantages of surgical coaching in academic institutions may be applied to continuous performance improvement and collaboration with surgeons in LMICs. Furthermore, coaching may aid in assessment of the well-established Lancet Global Surgery Indicators thereby improving surgical capacity in LMICs.
Understanding Communication Gaps in the Hospital Consultation Process

Cristina Fischer

BACKGROUND: Communication gaps have been tied to medical errors, treatment delays, and patient dissatisfaction. The hospital consultation process is particularly vulnerable to these gaps, but they have not been well studied.

OBJECTIVE: We aimed to evaluate which communication issues lend weaknesses to the consult process from the provider and patient perspective.

METHODS: As part of a quality improvement project, we evaluated provider inpatient communication event reports from February 2017 to January 2018. We also performed semi-structured interviews of inpatients who received either a medical oncology (MO) or general surgery (GS) consult. We performed qualitative content analysis on the data to uncover themes illustrating consult communication challenges. Themes were enumerated, and percentages were determined.

RESULTS: Of 782 event reports reviewed, 59 (9%) were categorized into six main groups related to physician-physician communication during consultations: 1) inadequate verbal communication between providers (73%); 2) inadequate verbal communication between provider(s) and the patient and/or family (10%); 3) inadequate chart documentation from providers (10%); 4) delays in communication (3%); 5) inappropriate communication (2%); and 6) not accepting a consult (2%). Inadequate verbal communication was further categorized by setting: ED (23%), inpatient (47%), and inpatient involving an operation/procedure (30%). Interviews of 33 inpatients with GS consults and 17 with MO consults were conducted between June and August 2018. Five major patient-perceived issues with provider communication were identified: 1) inadequate verbal communication between provider(s) and the patient/family (GS-38%; MO-43%); 2) poor communication between physicians (GS-15%; MO-14%); 3) communication with the patient before consensus on a plan has been reached (GS-5%; MO-12%); 4) use of excessive medical terminology (GS-2%; MO-0%); and 5) inadequate non-verbal communication (GS-3%; MO-2%).

CONCLUSION: Inadequate verbal communication between providers is frequently identified as problematic in the inpatient setting by both clinicians and patients. The periprocedural setting represents a significant portion of these communication issues. Strategies targeting the quality of provider-to-provider and provider-to-patient communication, particularly in the periprocedural setting, are likely to be most helpful to improve communication in the hospital consult process.
Peritoneal Dialysis after Renal Transplant Failure: A Different Beast Altogether

Vivian Gama

BACKGROUND: The number of patients starting dialysis after graft failure (DAGF) has been steadily increasing in the United States. This population differs significantly from those with native End Stage Renal Disease (ESRD) and little is known about the outcomes of DAGF patients on peritoneal dialysis (PD). We undertook this study to examine characteristics and survival of DAGF patients on PD compared to the native ESRD population on PD.

OBJECTIVE: We hypothesize that mortality outcome for patients who start PD after graft failure will be similar to those who start PD after kidney failure. We do not expect this association to change based on age, sex, other comorbidities, albumin level or year of dialysis initiation.

METHODS: We analyzed the United States Renal Data System (USRDS) to assess characteristics and survival of DAGF and native ESRD patients on PD. Mortality rates were compared after adjustment for age, sex, number of comorbidities, albumin level and year of dialysis initiation.

RESULTS: A total of 7.46% of DAGF and 7.09% of native ESRD patients used PD (p=0.01) and a total of 108,194 patients on PD were analyzed (Table 1). The mean age for DAGF patients on PD was significantly lower than native ESRD patients on PD (p<0.001). DAGF patients on PD were more likely to be employed than their counterparts with native ESRD (p<0.001). Those with DAGF had higher mortality than those with native ESRD (Table 2). This trend was even more significant after adjustment for age, sex, number of comorbidities, albumin level and year of dialysis initiation (p<0.001).

CONCLUSIONS: DAGF patients on PD have much worse outcomes compared to their native ESRD counterparts. The results of this study should encourage providers to consider DAGF PD patients as a high risk group and focus on risk reduction. Further research regarding the timing and cause of mortality in DAGF population on PD is needed.
Community Paramedic Pilot Program Operational Metrics and Impact on Patient Emergency Medical Services Utilization

Nicholas Genthe

BACKGROUND: Community Paramedicine (CP) is an expanding area of interest within the field Emergency Medical Services (EMS). Few studies have established operational metrics and outcome measures for CP programs. We aimed to evaluate operational metrics and change in 9-1-1 use among patients enrolled in a pilot, fire department-based, CP program.

OBJECTIVE: The purpose of this study is to determine if the ongoing CP program has decreased unscheduled emergency healthcare utilization. It is hypothesized that the implementation of community paramedicine visits will reduce 911 calls among high utilizer patients.

METHODS: A retrospective cohort study of adults enrolled in a CP program from 2016-2018 was performed. Patients were enrolled in the CP program if they frequently used a community emergency department or 9-1-1 services. A select group of experienced paramedics received targeted training in relevant concepts. Paramedics frequently contacted patients via both in-home visits and phone calls based on perceived clinical need. Through a review of electronic medical records, we collected patient demographic and clinical information and program operational metrics. The primary outcome of interest was the change in 9-1-1 use after enrollment. These two groups were compared using a paired t-test.

RESULTS: Of 29 patients that met inclusion criteria 24 were successfully enrolled, and data was available for 22 of the patients. Of these, 19 patients (86.3%) were female and 3 (13.6%) were male. 13 (59.1%) had a medical history of mental illness, 7 (31.8%) had a history of substance abuse, and 5 (22.7%) had a history of both. Total number of patient contacts was 742. Of these, 415 (54.9%) were in-person contacts and 334 (45.1%) were phone contacts. 265 (63.8%) of the in-person visits involved two paramedics and 150 (36.2%) involved one provider. Pre-enrollment 9-1-1 calls totaled 268, averaging 22.3 calls per month over the preceding 12 months. Post-enrollment 9-1-1 calls totaled 137 from enrollment date to present, averaging 11.1 calls per month. Average calls per month decreased by 50.2% (p=.004) post-enrollment, a reduction of 133 calls per year.

CONCLUSION: Following enrollment in a CP pilot program, participants’ use of the EMS system decreased by 50%. CP programs may be an effective way to support the most vulnerable patients and decrease EMS use. Further studies to more rigorously evaluate patient outcomes and assess the optimal level of intervention are needed.
Assessing the Clinical Feasibility of Whole-Body Dynamic FDG PET Imaging

John Li

BACKGROUND: In current standard of care (SOC) PET imaging for tumor assessment, a single snapshot of radiotracer distribution in a patient is acquired ~60 min post 18F-fluorodeoxyglucose (FDG) injection. Images are interpreted based on semi-quantitative standardized uptake values (SUV). However, this technique cannot visualize radiotracer dynamics across body regions over time, which can potentially improve diagnosis by distinguishing tumor from physiological processes such as infection or inflammation.

OBJECTIVES: We assessed the feasibility of a novel whole-body dynamic (WBD) PET protocol to model FDG dynamics using Patlak analysis and time activity curves (TAC). Additionally, a mean SUV map was synthesized from WBD PET and was compared with that of SOC PET.

METHODS: Eleven cancer patients underwent SOC PET/CT and WBD PET/MRI on the same day. WBD PET began ~30-55 min and SOC PET began ~50-70 min post FDG injection. Each set of WBD PET images consists of 4-7 passes through the body, with each pass significantly shorter (~3 min) than SOC passes (~30 min). Patlak analysis was done using a population-based arterial input function, scaled using image-derived blood activity concentrations in the left ventricle. Parametric images of the slope (Ki) and intercept (V) of Patlak plots were created to visualize radiotracer dynamics. Suspected tumor lesions on SOC and WBD images were manually contoured. TACs were generated by plotting activity concentrations in each lesion over time. Image quality was compared between SOC and mean WBD PET by 2 radiologists.

RESULTS: Three distinct parametric maps (SUV, Ki, and V) were obtained from each WBD PET scan. Ki maps showed regions with high rates of radiotracer uptake (e.g., tumors) and deemphasized regions of static uptake (e.g., inflammation, extravasation). V maps emphasized regions of constant radiotracer activity. TAC plots showed lesion-specific PET activities over time. Finally, the SOC and WBD PET images were concordant with good to excellent quality in 10 of 11 cases. Image quality was degraded in 1 WBD case in the head region due to motion artifact but did not impact image quality in the body.

CONCLUSIONS: The mean WBD PET has comparable image quality to SOC PET and shows promise for use in place of clinical SOC PET. WBD PET can model kinetics of radiotracer activity across multiple body regions and visualize advanced parametric imaging metrics for improved oncological diagnosis over current SOC PET protocols.
Radiofrequency Ablation for Treating Headache Related Pericranial Neuralgia

Sean Nguyen

BACKGROUND: Radiofrequency ablation (RFA) of nerves is a procedure used to treat chronic pain that is refractory to other treatments. The procedure involves placing an insulated needle adjacent to a nerve using fluoroscopy as guidance. Then, a current is passed through the needle which raises the temperature of the tissue melting the nerve. This disrupts the conduction of pain signals up the nerve which gives the patient relief from their pain. Prior to using this destructive technique, a physician must ensure that the target nerve is truly conducting the pain signals. This is done by using a nerve block. If the patient gets pain relief from the nerve block, it is reasonable to continue with the more permanent RFA procedure. Many insurance companies require, and many professional societies advocate for two of these diagnostic nerve blocks to be done prior to the RFA procedure. This requirement has significant cost implications on the procedure; the cost of a single nerve block is nearly $700. The cost of the RFA is roughly twice that. For these blocks to be cost effective, they would need to exclude 50% of patients from RFA. Our study was a retrospective chart review to analyze the percentage of patients that passed their first block but failed their second block. That is, how often does this second block exclude patients from the RFA procedure.

OBJECTIVE: Our hypothesis was that a second diagnostic block does not add enough information to be a cost-effective method for patient selection, as evidenced by the percentage of patients that failed the second block after passing the first.

METHODS: The charts of all patients receiving RFA at UW-Health’s clinics and hospitals between June of 2014 and June of 2018 were reviewed (N=496). From the charts, data was added to an excel database to facilitate easy analysis. Variables collected included: age, sex, the site of RFA, results of the RFA procedure, which nerve blocks were performed, and the results of the nerve blocks.

RESULTS: The analysis of the database yielded a result that supported our hypothesis: of the patients who passed their first block, only 10.9% of patients failed their second block.

CONCLUSIONS: With only 10.9% of patients failing their second block, these blocks are ultimately fruitless in aiding in the selection of patients for RFA. This provides evidence that these nerve blocks have been a misuse of healthcare resources and has significant cost-saving implications.
Peritoneal Dialysis in the Elderly: An Opportunity Not to Miss

Jakob Ohman

BACKGROUND: End Stage Renal Disease (ESRD) prevalence is steadily increasing in the United States with 700,000 patients currently requiring some form of renal replacement therapy, with a steeper increase in prevalence in the older population (age > 65 years). The rate of peritoneal dialysis (PD) utilization in the US is low at 7% of the total ESRD population.

OBJECTIVE: The aim of this study is to find the rate of utilization of PD in older patients and examine the outcomes of PD compared to hemodialysis (HD) in old patients segmented into chronological age groups in order to study modality-based survival as age advances.

METHODS: We utilized the United States Renal Data System (USRDS) to track the survival of patients with ESRD who started dialysis between 2001-2014. Survival of patients on PD and HD was compared in three age groups: age 65-74, age 75-84, and age >85. Comparisons of PD and HD were adjusted for sex, year of initiation of dialysis and number of comorbidities, and mortality rates were calculated.

RESULTS: A total of 743,229 patients were analyzed in the 3 different age categories. Prevalence of PD use was lower among older ESRD patients, with 6%, 4%, and 3% of patients using PD in the three age groups: 65-74 (N=21,776), 75-84 (N=11,978), >85 (N=2,426), respectively. PD was associated with lower mortality compared to HD across all age groups after adjustment for sex, race and number of comorbidities, as demonstrated by hazard ratios comparing PD survival to HD survival of 0.89, 0.94, and 0.91 across age groups 65-74 years, 75-84 years, and > 85 years, respectively.

CONCLUSIONS: PD is underutilized in the older population but overall is associated with a lower mortality in these patients. Despite comorbidity adjustments, it is possible that PD patients are inherently healthier than HD patients. However, the results of this study should encourage providers to strongly consider PD as an option in older patients.
Improving metabolic health through reduced consumption of specific dietary amino acids

Eunhae Park

BACKGROUND: Dietary interventions have received significant attention as tools for countering the global obesity and diabetes epidemic. Although calorie restricted diets improve metabolic health, weight loss is difficult to sustain through these methods. Specifically reducing dietary intake of the three branched-chain amino acids (BCAAs) leucine, isoleucine, and valine promotes the metabolic health of diet-induced obese mice.

OBJECTIVE: We hypothesize that reduction of dietary BCAAs will improve blood sugar control and reduce the adiposity of obese, prediabetic humans. Our study will establish the feasibility of reducing dietary BCAAs via BCAA-free meal replacement shakes.

METHODS: The inclusion criteria are: male, ages 35-65, BMI 28-35, fasting glucose 101-125mg/dL and/or hemoglobin A1c 5.7-6.4%, stable weight, not taking supplements, and not beginning exercise or diet program. We aim to recruit up to 16 subjects. BCAD2 (Mead Johnson) is a fortified medical food powder that lacks BCAAs. Whey protein powder (Abbott Labs) contains BCAAs. Participants are randomized for 60 days to either the BCAD2 treatment arm or the Whey protein control arm in a double-blinded fashion. Subjects attend five visits to longitudinally measure anthropometric and metabolic parameters: oral glucose tolerance test, resting metabolic rate, body composition, and fasting blood glucose and insulin. The feasibility of reducing dietary BCAA intake by at least 50% will be measured through the use of food diaries, phone calls, and returned powder to calculate BCAA intake and compliance with the study protocol.

RESULTS: Ten subjects have been recruited to participate in our study thus far; we expect to finish collecting data for current participants by late October. Thus far, one (of one) subject has completed the study while consuming BCAD2, and reduced his dietary BCAA intake by approximately 72%, demonstrating the feasibility of this intervention.

CONCLUSIONS: The principal outcome of this study is to determine the feasibility of using meal replacement shakes to reduce dietary BCAA intake in a clinical study. Secondary findings may include preliminary results on whether the metabolic effects seen in mice are also observed in humans. If we determine that reducing dietary BCAAs using BCAD2 is feasible, we will propose a larger study that will definitively test if specifically reducing dietary BCAAs can improve metabolic health in obese and prediabetic humans.
Does high BMI or high insulin requirements in simultaneous pancreas-kidney transplant candidates increase the risk of graft failure or return to insulin?

Phuoc Pham

INTRODUCTION: Simultaneous pancreas kidney (SPK) transplantation is effective treatment for T1D and chronic kidney disease. Several studies found similar transplant outcomes between T1D and T2D SPK recipients, and suggested that SPK transplantation might be associated with improved patient and kidney survival compared to kidney transplantation alone. However, limited data are available regarding the effect of recipient factors such as age, pre-transplant BMI (BMI), or pre-transplant insulin requirements (Pre-IR) on graft and patient outcomes for T2D SPK recipients.

OBJECTIVES: In this study, we assessed the effects of recipient BMI and Pre-IR on the outcomes of SPK transplantation in T2D patients, and compared these to the impact of those parameters on T1D SPK recipients.

METHODS: A total of 323 SPK patients at the University of Wisconsin Hospital between 2006-2017 were assessed for recipient BMI, Pre-IR, post-transplant diabetes (PTDM) (defined by post-transplant return to an oral hypoglycemic agent (OHA) and/or return to any insulin for >3 consecutive months) and graft failures (GF) (as reported for resumption of insulin, pancreatectomy, or death). Additional variables controlled for included: Donor: age, race, gender, BMI, type (DBD vs. DCD), KDPI, CIT; and Recipient: age, gender, race, donor-recipient CMV/EBV status and induction therapy. Data collection was completed using UW Transplant Database and EHR.

RESULTS: The 323 patients were categorized: 284 T1D and 39 T2D patients based on several clinical parameters. During the follow-up period, 52 patients (16.1% [49 T1D and 3 T2D]) resumed insulin for >3 months, 23 patients (7.1%, all T1D) initiated OHA use post-transplant. Overall, 59 patients (18.2%) experienced GF (pancreatectomy: 18 T1D, 1 T2D; resumption of insulin: 37 T1D, 3 T2D). In T2D patients, BMI and Pre-IR were not significantly associated with GF (pBMI = 0.71; ppre-IR = 0.30) or PTDM (pBMI = 0.58; ppre-IR = 0.54). In T1D patients, neither BMI nor Pre-IR was significantly associated with GF (pBMI = 0.71; ppre-IR = 0.30) or PTDM (pBMI = 0.58; ppre-IR = 0.54). In T1D patients, neither BMI nor Pre-IR was significantly associated with GF (pBMI = 0.12; ppre-IR = 0.16) or PTDM (pBMI = 0.14; ppre-IR = 0.16).

CONCLUSION: In this study, we could not identify a significant association between these pre-transplant parameters and graft failure in general, or PTDM specifically, in T2D SPK recipients. These observations could inform a less restricted approach in offering SPK transplants to T2D recipients.
Using Quality Improvement to Address Low Serum Albumin in Hemodialysis Patients

Catherine Richardson

BACKGROUND: According to the most recent U.S. Renal Data System Annual Report, more than 660,000 Americans are being treated for end stage renal disease (ESRD), and of these, 468,000 are dialysis patients. It is estimated that approximately 45% of patients on dialysis are malnourished, which is reflected clinically using a serum albumin level. Low serum albumin levels are independently associated with increased morbidity and mortality, and the available evidence suggests that nutritional supplementation administered orally or parenterally is one effective intervention that can improve this level.

OBJECTIVE: This study utilized a Quality Improvement framework to address low serum albumin levels in dialysis patients at the Wisconsin Dialysis Institute (WDI), Fitchburg, Wisconsin. Our aim is to decrease the percent of hemodialysis patients with serum albumin levels <3.5 g/dL to less than 15% by June of 2019.

METHODS: We applied the Quality Improvement strategies to assess the issue of low albumin levels in the in-center dialysis patients. A working group of dietitians, social workers, physicians, and clinical staff was established to identify barriers. Observation of laboratory data and workflow practices was utilized to create a process map and fishbone diagram which was evaluated by an inter-professional team of invested stakeholders. Using the input of the team, a literature search was performed to identify evidence-based interventions to improve serum albumin levels in dialysis patients, and a treatment algorithm was then developed and implemented to the current workflow. For an outcome measure we intend to measure the percent of patients with serum albumin levels <3.5 g/dL. For a process measure we intend to measure the number of patients with serum albumin levels <3.5 g/dL for which this algorithm was utilized.

RESULTS: Thirty patients were identified with serum albumin levels <3.5 g/dL, (3.34 g/dL, range, 2.8-3.49 g/dL) between the months of 4/1/2017-4/31/2018. Data collection began 9/1/2018 and will be measured at 1-, 3-, and 6-month intervals.

CONCLUSION: This quality improvement project utilizes an evidence-based approach to identify dialysis patients that may benefit from oral or parenteral nutrition, as well as other interventions including access to food banks, wound care, and nutrition education. The strength of this model lies in using a multidisciplinary team perspective, and systematic approach to the care of all dialysis patients.
Surgeon Reflections on the Use of a Question Prompt List by Patients Considering High-Risk Operations

Sophie Shogren

BACKGROUND: For older adults considering high-risk surgery, the decision to pursue surgery can be complicated and confusing. The Question Prompt List (QPL) is a brochure—designed by patients and families—that provides questions to help patients consider options, understand expected outcomes, and prepare for possible complications. The QPL is mailed to patients prior to their preoperative clinic visit to prepare them for participation in a decision-making conversation.

OBJECTIVE: To characterize surgeons’ attitudes about use of the QPL with patients.

METHODS: We performed a randomized clinical trial involving 430 patients and 40 oncologic and vascular (cardiac, peripheral, neuro) surgeons at five U.S. hospitals. Upon completion, we performed face-to-face interviews with 11 surgeons. We asked the surgeons to describe how the QPL impacted preoperative conversations with patients—specifically, how the QPL may or may not have assisted patients with participation in decision-making. We audio recorded and transcribed each interview. Two investigators coded each transcript inductively using constant comparison. We created construct tables to facilitate comparison of the transcripts and characterize surgeons’ perceptions of the QPL.

RESULTS: Surgeons reported that the QPL empowered patients to ask questions they otherwise may not have asked. “[Patients] may not be aware that they have the right to ask those questions... so I think this gives them the license to do that.” Surgeons were divided about whether the QPL changed patient decision-making about surgery. One surgeon reported, “There are patients that decided not to proceed with surgery because of the pamphlet...” Others noted the QPL allowed patients to identify their goals and values. “I don’t think it changed their decision to have the surgery... It just gave them a useful platform to go back and sort of look at what might be important to them.” Some surgeons worried the questions were redundant and time consuming, but noted repetition was helpful to patients. “So it became less of a hindrance than I thought it would be and more of a reaffirmation of what we said.”

CONCLUSIONS: Surgeons were typically supportive of the QPL and patient use of the brochure during preoperative conversations. Although surgeons had concerns about the questions extending patient visits, they praised the QPL for giving patients confidence to ask questions and consider how surgical intervention may or may not help them meet their goals.
Regulating the immune landscape in pancreatic ductal adenocarcinoma

Chelsie Sievers

BACKGROUND: While immune therapies have shown great promise for some cancers, to date pancreatic ductal adenocarcinomas (PDAC) have been largely resistant to immunotherapeutic approaches. Tumor infiltrating lymphocytes, which are responsible for eliciting an immune response, are largely excluded from PDAC. The mechanisms by which this exclusion occurs are not well characterized but are thought to involve both innate and adaptive immune responses. An improved understanding of the immunoregulatory mechanisms and a means by which to overcome these processes are critical to developing improved treatment options for patients with pancreatic cancer.

OBJECTIVE: The primary objective of this study was to investigate how dual immunotherapeutic treatment, targeting PD-1 and CSF1R, changes the tumor immune cell niche and tumor growth in a mouse model of PDAC.

METHODS: Experimentally naïve B6 and B6.BATF3−/− mice were subcutaneously injected with the murine KPC tumor line (Pdx-1-Cre; LSL-KrasG12D; LSL-Trp53R172H) to establish allograft tumors. Once tumors were palpable, mice were randomized into four treatment groups: vehicle control, anti-PD-1, anti-CSF1R, or combination anti-PD-1 plus anti-CSF1R. Tumor dimensions were measured twice weekly for 15 days. Upon conclusion, tissue was collected for further analysis.

RESULTS: In B6 recipient mice, combination anti-PD-1 plus anti-CSF1R resulted in lower tumor growth rates (11 ±17) than vehicle treated controls (121 ±174), p-value=0.02. Flow cytometry of the spleens of tumor-bearing mice demonstrated an increase in conventional dendritic cells with combination treatment compared to controls, 15.3 ±2.3%, 8.3 ±0.6%, respectively (p-value=0.02). Mice lacking conventional dendritic cells (B6.BATF3−/−) had an accelerated tumor growth rate compared to wildtype B6 mice when receiving combination treatment, 84 ±78, 11 ±16, respectively (p-value=0.01).

CONCLUSIONS: Taken together these data show that the combination of immune checkpoint inhibitor, anti-PD-1, along with the inhibition of the macrophage-predominant cytokine, anti-CSF1R, slows PDAC tumor growth in a conventional dendritic cell dependent manner. Further characterization of the interplay between innate and adaptive immune cells upon immunotherapy treatment should be investigated to increase the efficacy of these therapeutics.
Knowledge and Attitudes Regarding LTBI Treatment Among the Tibetan Monastic Population Living in India: Recommendations for the Zero TB Campaign

Sam Starke

Background: In an effort to eradicate tuberculosis (TB) in the Tibetan refugee population living in India, the Zero TB program conducts institutional screening and treatment of Latent TB infection (LTBI) in high incidence settings such as boarding schools, Buddhist monasteries and nunneries. Attaining widespread acceptance of Rifampin Preventative Therapy (RPT) in the monastic population has proven challenging.

Objective: To assess knowledge and perceptions of LTBI in latently infected monks and nuns, exploring factors affecting their decisions to accept or refuse RPT.

Methods:
Study Design: Cross-sectional survey and semi-structured, in-depth group interviews of LTBI+ residents from seven Tibetan monastic institutions near Dharamsala, India.
Participants: Monks, nuns, and staff previously diagnosed with LTBI during institutional screening. Surveys were administered to all LTBI residents (n=238) in five sites. Representative members from six sites were recruited for group interviews.
Analysis: Knowledge of LTBI was assessed with a six-question tool and attitudes towards RPT using belief statements. Survey responses were analyzed in SAS. Qualitative data from interviews was compiled and analyzed to generate codes, themes, and quotations.
Ethics Approvals: This project was exempt from IRB review by designation as program evaluation.

Results: 161 surveys were completed, and 18 monks/nuns participated in 6 group interviews. Knowledge regarding LTBI was low (mean knowledge score: 2.59 out of 6, SD: 1.81). Factors associated with RPT acceptance included perceived individual and community benefit. Factors associated with refusal included side effects, low perceived likelihood of developing active disease, and co-morbid conditions. Interestingly, higher knowledge scores were associated with RPT refusal. Recurrent themes influencing individual decision-making included peer discussion and institutional leadership.

Conclusions: Gaps in LTBI knowledge in the monastic population may be addressed through education, but utilizing peer-to-peer education and institutional opinion leaders may be more effective strategies for encouraging RPT acceptance within these settings. This program assessment highlights possible limitations of educational interventions, suggesting that the source of guidance is important in such communities. The scope and generalizability of this survey is limited as a pilot project.
Purpose: Develop a deep learning system that detects prostate cancer using 3D bounding boxes that performs comparably to radiologists. This system could direct radiologists’ attention towards suspicious regions of multiparametric magnetic resonance imaging (mpMRI) of the prostate and/or improve MRI-guided biopsies.

Materials and Methods: An institutional review board approved this study in which 186 prostate cancer patients, from six institutions worldwide, underwent prostate mpMRI either with (n=92) or without (n=94) an endorectal coil. Patients’ images were randomly placed into three sets: train (n=120), validate (n=19), and test (n=47). Each mpMRI has three sequences: T2 weighted image (T2WI), apparent diffusion coefficient (ADC), and a high b-value sequence. Ground truths were tumor segmentations manually drawn by expert radiologists using histopathological interpretations of radical prostatectomy whole mount specimens (RPWMS). We evaluated three neural networks—UNet, a multiclass UNet, and LinkNet—and two bounding box extraction techniques. A box detects a lesion if its intersection over union with the ground truth segmentation exceeds 50%.

Results: Our LinkNet-0.418 system gave the best performance. It detects 58 of 82 cancers (71±4%), surpassing the literature value for radiologists (46.7%). LinkNet-0.418 proposed 1.5±0.1 false positive boxes per patient. The positive predictive value (PPV) that a box contains a lesion (36±3%) is lower than radiologists (74.6%). LinkNet-0.418 detected at least one cancer in 83±3% patients, exceeding radiologists’ index-lesion detection rate (77.6%). Boxes extracted from LinkNet-0.418 were clinically sensible: hypo-intense in T2WI and ADC, and hyper-intense in high b-value.

Conclusions: Using boxes to guide biopsies could lead to a 71% cancer detection rate with a 36% PPV at the lesion level.
Investigating The Role Of Rac1 And ROCK Signaling In Breast Cancer Cell Migration In Aligned Matrices

Rachel Van Doorn

BACKGROUND: The organized activity of the small GTPase, Rac1 and the Rho-associated protein kinase, ROCK are essential for cell migration and contractility. Deregulation of these proteins through their respective guanine exchange factors (GEF’s) and GTPase activating protein (GAP’s) can result in significant changes in migratory behavior in an aligned microenvironment. While many studies have investigated cell migration in 2D, little is known regarding the cellular mechanisms that regulate breast cancer cell migration and protrusive events in 3D. Our group has published that specific organizations of collagen, defined as, Tumor-Associated Collagen Signatures (TACS), contribute to poorer patient prognosis and faster progression to metastatic disease. This TACS described is known as TACS III, and is used to define collagen that is aligned perpendicular to the tumor boundary.

OBJECTIVE: Rac1-specific regulators, DOCK180 and FilGAP are spatially and temporally regulated in metastatic breast cancer cells. We hypothesize that Rac1 activity is localized along the axes of aligned fibers due to its activation by DOCK180. FilGAP activity is localized to the lateral edges of the cell due to ROCK activation. This organization promotes an invasive migratory phenotype along the axis of aligned collagen fibers in the tumor microenvironment.

METHODS: Here, we further investigate this phenomenon using non-electro-spun nanofiber scaffolds to assess mechanisms of cell migration and protrusion dynamics in both aligned and random 3D collagen-like matrices. Live MDA-MB-231 cells tagged with green fluorescent protein (GFP) are imaged using an epi-florescent microscope with time-lapse acquisition. Cell are analyzed using MTrackJ-a plugin for FIJI. In addition to the control MDA-MB-231-GFP cells, Rac1 and ROCK inhibited cells are imaged as well as doxycycline-inducible cell lines knocking down DOCK180 and FilGAP.

RESULTS: Consistent with previous in-vitro studies, we determined that MDA-MB-231 cells seeded into aligned, 3D collagen environments had fewer protrusions and migrated more persistently than those seeded into random, 3D collagen environments. Notably, the protrusions also correlated with the direction of fiber alignment. Preliminary data suggests that the Rac1-specific GEF, DOCK180, and GAP, FilGAP may play a role in dictating these cellular protrusions and migratory behaviors in aligned matrices.

CONCLUSIONS: Defining and localizing the mechanism that underpins 3D mechano-sensing during breast cancer cell migration will enhance the current understanding of progression to metastatic disease on a cellular level.
Relative Clinical Outcomes Comparing Manual and Robotic Assisted Total Knee Arthroplasty at Minimum 1 Year Follow-up

Jesse Wang

BACKGROUND: Despite the high rates of implant survival in total knee arthroplasty (TKA), there remains a 10-20% dissatisfaction rate at long term follow up. Robotic-assisted TKA (raTKA) has been introduced to improve preoperative planning, increase surgical accuracy, reduce soft tissue damage, and establish reproducible surgical workflows to achieve optimal alignment and ligament balance. Few studies have examined the clinical outcomes comparing manual TKA (mTKA) and raTKA.

OBJECTIVE: The purpose of this study is to compare clinical outcomes of raTKA and mTKA at a 1-year minimum follow-up interval.

METHODS: 159 mTKA and 148 raTKA performed by Dr. Richard Illgen utilizing the Stryker Triathlon implant system were included for retrospective review. Clinical evaluation at one-year follow-up comparing the two cohorts includes rates of revision, manipulation, reoperation, and patient reported outcomes measures (PROMs) such as VR-12, KOOS-Jr, Forgotten Joint Score (FJS), and UCLA Activity Score. Similarly, rates of intraoperative complications, 30 and 90-day readmission, and home post-operative discharge disposition were compared between mTKA and raTKA. Statistical analysis for PROMs used post-hoc t-test while comparison of two proportions used Pearson’s chi-squared test.

RESULTS: There was also no difference in rates of revision, reoperation, intraoperative complication, 90-day readmission, or manipulation between raTKA and mTKA. For the raTKA group, there was a higher rate of home discharge (95.95% vs 83.65%, p<0.001) and reduced 30-day readmission (0.68% vs 5.66%, p=0.014). Postoperative PROMs comparing raTKA and mTKA demonstrated no significant differences for VR-12 and UCLA, but higher scores were achieved in the raTKA cohort for the KOOS-Jr (76.31 vs 72.18, p = 0.041) and FJS (58.62 vs 52.69, p = 0.024). The change in preoperative to postoperative PROM values (ΔPROMs) were significantly higher in raTKA compared to mTKA for KOOS-Jr scores (23.58 vs 15.57, p=0.037).

CONCLUSIONS: Improved clinical outcomes including higher rates of home discharge, lower 30-day readmissions rate, and higher KOOS-Jr, FJS, and ΔKOOS-Jr scores were noted at one-year follow-up comparing raTKA and mTKA techniques. Limitations of this study include the retrospective and single surgeon design. This study was also not blinded and it is possible that patient awareness of utilizing either the manual or robotic technique might bias their perception of outcomes.
Factors Influencing the Measurement of Antibiotic Utilization in Nursing Homes

John Ziegler

BACKGROUND: Up to 75% of antibiotics prescribed in nursing homes (NHs) are inappropriate and the CDC has called for the implementation of antibiotic stewardship programs (ASPs) to combat rising trends in antibiotic resistance in these facilities. Reliable measurement of antibiotic utilization is a critical feature of ASPs. Studies performed in hospitals have shown that how utilization is measured can have a large impact on the relative rates of antibiotic use across facilities. However, few studies have examined how differences in measurement methods can influence relative rates of antibiotic utilization in NHs.

OBJECTIVE: To evaluate how different metrics, prophylactic antibiotic use, and hospital-initiated antibiotics influence relative rates of antibiotic use across NHs.

METHODS: Data for 1,434 antibiotic courses prescribed in five Wisconsin NHs were collected prospectively (range: 8 - 21 months). antibiotic utilization, overall and by antibiotic class, was characterized using three different metrics: 1) antibiotic starts (AS); 2) days of therapy (DOT); and 3) length of therapy (LOT), all normalized per 1,000 resident-days. Additional comparisons excluding antibiotics prescribed for prophylaxis and those initiated in the hospital and continued upon transfer to the NH were performed. We then ranked the five study NHs by their overall antibiotic use during the eight months for which concurrent data were available and examined if rankings changed when hospital-initiated antibiotics were excluded.

RESULTS: 1,707 antibiotics were administered during the 1,434 prescribing events. Broad spectrum antibiotics were used frequently, accounting for 55% of antibiotics administered (n=946) and 44% of DOT (n=8,138). Prophylactic use accounted for a large portion of antibiotic utilization. Among NH-initiated antibiotics, a group including fosfomycin, nitrofurantoin, and trimethoprim was 5th most frequently used when measured by antibiotics administered (n=81), but was the most frequently used by DOT (n=2,303). After excluding prophylactic antibiotics, this group remained 5th most commonly administered (n=74) but fell to 4th by DOT (n=527). Exclusion of prophylactic antibiotics had minimal impact on antibiotic utilization per 1,000 resident-days when measured by AS (7.4 with vs. 6.9 without) but a substantial impact when utilization was measured by DOT (95.8 with vs. 68.0 without) and LOT (89.0 with vs. 61.7 without). The correlation between NH antibiotic utilization overall and when hospital-initiated antibiotics were excluded was moderately positive for AS (r=0.58 with prophylaxis, 0.61 without), DOT (r=0.51 with and without prophylaxis), and LOT (r=0.58 with prophylaxis, 0.61 without). NH1 had the highest overall antibiotic utilization (85.1 DOT per 1,000 resident-days) but was ranked as having the 2nd lowest antibiotic utilization (23.4 DOT per 1,000 resident-days) when hospital-initiated antibiotics were excluded.

CONCLUSIONS: Our study demonstrates frequent utilization of broad spectrum antibiotics in NHs, increasing the risk of greater antibiotic resistance in this setting. Our study also shows that prophylactic antibiotic use as well as hospital-initiated antibiotics have a significant influence on overall antibiotic use in NHs. These factors should be taken into account in the development of systems to track and compare antibiotic use across multiple NHs.