

for planning and guide creation in the wide variety of craniofacial surgeries performed. The average deviation of post-operative anatomy from pre-operative plan was also not statistically significant when Black Bone MRI versus CT scans were utilized in the surgeries. These results then enabled the translational application of this technology clinically, and we demonstrate a clinical reconstructive craniofacial case planned utilizing Black Bone MRI. **DISCUSSION/SIGNIFICANCE OF IMPACT:** This study demonstrates that virtual surgical planning and 3d surgical guide creation can be performed using Black Bone MRI with comparable accuracy to CT scans in a wide variety of craniofacial procedures. This could dramatically reduce radiation exposure for patients. The successful segmentation, virtual planning, and 3d printing of accurate guides from Black Bone MRI demonstrate potential to change the pre-operative planning standard of care. This project, overall, also demonstrates the development of new solutions to advance clinical care, thus serving as an example of moving translational science from a concept to the operating room.

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### **Catecholamines and Opioid Therapy Requirements for the Management of Acute Post-Procedural Pain: The clinical Trend to Identify Remarkable Elements in Opioid Drug Dependency**

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**OBJECTIVES/GOALS:** To compare the opioid drug requirements amongst those individuals with high levels of catecholamines in blood and acute post-procedural pain, by ICD9/10 codes (experimental) to those with normal levels of catecholamines and acute post-procedural pain (AP-PP) only (controls) **METHODS/STUDY POPULATION:** In collaboration with both the Informatics and the Biostatistics Departments at CTSI and under the auspices of the IRB at the University of Rochester, we completed the collection of ~8,000 electronic health records (EHRs) of adults 18 years and older with surgical appointments at Strong Memorial Hospital (SMH), who met inclusion criteria, from January 2006 to September 2019 and received Fentanyl therapy for AP-PP management. Subjects were categorized in a two-arm-matched case-control fashion. A ratio of 1(Experimental):1(Control) was utilized. Analytic comparisons were completed using normal distribution statistical methods with  $p > 0.1$  for significance. **RESULTS/ANTICIPATED RESULTS:** After removal of duplicates and exclusion of EHRs, a total of 17 subjects met inclusion criteria for the experimental group. We matched controls ( $n = 17$ ) with experimental subjects for age, gender and surgical procedure for accurately compare opioid requirements in the postoperative recovery. Mean age of subjects was 69(+/-10.1235) years old. Most of subjects were females (70%). Mean Fentanyl requirement was significantly different in the experimental group 466.17(625.621)mcg compared to 215.58(353.323)mcg in the controls ( $p$  value 0.07832) **DISCUSSION/SIGNIFICANCE OF IMPACT:** It is suggested that healthy individuals with genetic variations in pain pathways including; the COMT and MAOA rendered individuals with higher levels of catecholamines in the body driving abnormal responses to pain sensitivity. We emulated this genetic variation for clinical purposes using ICD10/9 codes of those with conditions related to higher catecholamine levels in the body.

Based on our preliminary results, we suggest that COMT and MAOA genetic variations could impact opioid drug use and the current opioid dependency and epidemics in the U.S. This study will address remarkable questions and identify strategies about this topic.

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### **Clinical Implementation of Monte Carlo Dose Calculation for Patient-Specific Radiotherapy Quality Assurance**

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**OBJECTIVES/GOALS:** The Monte Carlo dose calculation method is often considered the “gold standard” for patient dose calculations and can be as radiation dose measurements. Our study aims to develop a true Monte Carlo model that can be implemented in our clinic as part of our routine patient-specific quality assurance. **METHODS/STUDY POPULATION:** We have configured and validated a model of one of our linear accelerators used for radiation therapy treatments using the EGSnrc Monte Carlo simulation software. Measured dosimetric data was obtained from the linear accelerator and was used as the standard to compare the doses calculated with our model in EGSnrc. We will compare dose calculations between commercial treatment planning systems, the EGSnrc Monte Carlo model, and patient-specific measurements. We will implement the Monte Carlo model in our clinic for routine second-checks of patient plans, and to recalculate plans delivered to patients using machine log files. **RESULTS/ANTICIPATED RESULTS:** Our Monte Carlo model is within 1% agreement with our measured dosimetric data, and is an accurate representation of our linear accelerators used for patient treatments. With this high level of accuracy, we have begun simulating more complex patient treatment geometries, and expect the level of accuracy to be within 1% of measured data. We believe the Monte Carlo calculation based on machine log files will correlate with patient-specific QA analysis and results. The Monte Carlo model will be a useful tool in improving our patient-specific quality assurance protocol and can be utilized in further research. **DISCUSSION/SIGNIFICANCE OF IMPACT:** This work can be implemented directly in clinical practice to ensure patient doses are calculated as accurately as possible. These methods can be used by clinics who do not have access to more advanced dose calculation software, ensuring accuracy for all patients undergoing radiotherapy treatments.

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### **Clinical utility of precision medicine approaches to guide anti-platelet selection for adult patients with acute coronary syndromes (ACS), following percutaneous coronary intervention (PCI)**

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**OBJECTIVES/GOALS:** Our goal is to determine if a precision medicine approach to guide anti-platelet therapy for patients with ACS, post PCI, is feasible for a diverse urban population. Also, we will evaluate if guided therapy reduces major adverse cardiovascular