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PURPOSE: Breast reduction mammoplasty (BRM) is one of the most commonly performed plastic surgery procedures. Historically, patients were admitted as inpatients for post-operative monitoring; more recently, surgeons have increasingly utilized 23 hour observation or even true outpatient status for patients undergoing BRM. Despite this trend, nearly 20% of BRM operations are still performed with formal admission. We hypothesize that this practice confers no benefit in terms of safety outcomes and engenders a substantial financial burden for patients and the larger healthcare system.

METHODS: We reviewed the Truven Health Analytics MarketScan Commercial Claims and Encounters database and identified patients using the Common Procedural Terminology (CPT) code for BRM. This allowed for the construction of three cohorts: inpatients, 23 hour observation, and outpatient; comparisons were made between inpatients and outpatients and observation patients and outpatients. Medical morbidities were identified using CPT codes. A propensity score match was utilized to balance covariates across the cohorts. The primary outcome variable was 14 day representation rate, either to the emergency department or admission to the hospital. Secondary outcomes include specific surgical complication rates. Financial data regarding net payments for the surgical encounter and gross payments to the surgical provider were collected.

RESULTS: In the comparison of inpatient surgery to outpatient surgery, each cohort is composed of 1,237 patients (N = 2,474 total patients). The cohorts comparing 23 hour observational status with true outpatients included 8,153 patients each (N = 16,306 total patients). The distributions of Charlson comorbidity index, individual medical morbidities, and obesity were similar across all comparisons. In the comparison of inpatients and outpatients, the 14 day representation rate was 1.4% for inpatients and 0.3% for outpatients (p < 0.01). The overall surgical complication rate was significantly higher for inpatients (7.8%) than for outpatients (4.9%) (p < 0.01). When compared to outpatients (median cost $9,077), inpatient service (median cost $19,975) resulted in $10,898 more in services paid for. Similarly, observation services (median cost $12,451) generated $4,050 more in payments than outpatients (median cost $8,401) (p < 0.01). There was no difference in surgeon professional fee between the care settings.

CONCLUSIONS: Outpatient BRM is equivalent to post-operative observation or admission with regard to safety outcomes. Furthermore, avoiding observation or admission represents a potent opportunity to save thousands of dollars per patient. This data suggests that outpatient BRM represents the optimal balance of safety and cost effectiveness whereas observation services should be discouraged. Inpatient admission, though most expensive, may still be indicated in select, medically complex patients.

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Novel Smartphone-based Free Flap Monitoring Tool Using Machine Learning

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PURPOSE: Free flap monitoring is important to ensure early detection of arterial or venous failure to facilitate salvage. Our prior research has shown ability to magnify skin change as a result of skin changes. This study was undertaken to test the feasibility of detecting venous and arterial occlusion using a smartphone camera and pattern recognition (a simplistic implementation of a machine learning algorithm).

METHODS: Bilateral hands of seven patients were video recorded with various tourniquet pressures on one hand simulating no occlusion, venous occlusion, and arterial occlusion with the other hand as internal control. Video data resolved at an average iPhone camera quality of 33 fps was processed using the sci-kit learn library in Python to detect changes in color frequency between frames and then
compared to the control hand. Comparing the test hand to the control hand allowed for the depiction of the “delta” that was sensitive enough to detect changes on a video without any additional augmentation.

RESULTS: The average rate of change in red pixels between video frames was noticeably different compared to control for both arterial occlusion (1.06x greater) and venous occlusion (1.07x greater). A graphical representation depicted a clear relationship while an individual was undergoing occlusion. There was a consistent pattern amongst patients returning from arterial occlusion to no occlusion as well that consisted of an increase in rate of average pixel change oscillations and greater range (The lowest bound corresponding to each individuals no occlusion chart, and the highest bound corresponding to that for venous occlusion).

CONCLUSION: Our smartphone video capture and analysis facilitates visualization of skin perfusion and can distinguish between states of no occlusion, arterial occlusion, and venous occlusion. The pattern shown after recovering from occlusion suggests that a similar pattern might be observed in tissue about to undergo occlusion, and implicates future studies could isolate diagnostic biomarkers before occlusion. This study shows promise for the use of inexpensive smartphone monitoring in a clinical setting for accurate free flap monitoring.

QS15
Systematic Review and Guidelines for Perioperative Management of Pediatric Free Tissue Transfer Patients

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PURPOSE: Microsurgical free tissue transfer has gained popularity for various reconstructive applications in children, with successes reported despite the technical challenge of small caliber vessels. Although several recent publications describe strategies for perioperative care of adult free tissue transfer patients, no guidelines exist for children. The goal of this study was to identify the best available evidence on perioperative management of pediatric patients undergoing free tissue transfer, and to develop evidence-based recommendations to optimize outcomes.

METHODS: A systematic review of the literature was conducted in Pubmed, Embase, Scopus, and Cochrane Library databases from inception until June 2017. Two reviewers screened the search results to identify strategies to guide perioperative care of pediatric free tissue transfer patients. Due to the scant, low-level evidence found upon preliminary search of the pediatric microsurgical literature, both pediatric anesthesia guidelines for healthy children undergoing major surgeries as well as specific studies of pediatric free tissue transfer patients were included.

RESULTS: 170 articles were selected, their full text was reviewed, and 47 articles met criteria. Reasons for exclusion included vague / absent descriptions of perioperative care parameters, case reports, and studies of syndromic or chronically ill children. Management approaches specific to the pediatric population were identified, classified according to level of evidence (LOE), and used to formulate recommendations in six categories: patient temperature, anesthesia, fluid administration/blood transfusion, anticoagulation, and vasodilator use.

CONCLUSION: High quality (LOE 1) data was found for all but patient temperature (LOE 3) and vasodilator use (LOE 4) in the pediatric anesthesia literature, while the microsurgical literature provided LOE 3 data for anesthesia and analgesia, and LOE 4 data for all other categories. Key recommendations include administration of sevoflurane to induce general anesthesia, with supplemental regional blocks placed under ultrasound guidance (LOE 1). Regional sympathetic blockade improves outcomes in upper extremity microsurgery, and should be continued for postoperative pain control (LOE 3). A multimodal analgesia strategy should be implemented including NSAIDs (LOE 1). Preoperative fasting should be limited to 2–6 hours (LOE 1). Isotonic crystalloid should be used perioperatively (LOE 2), and transfusions restricted until hemoglobin <7 g/dl (LOE 1). Venous thromboembolism prophylaxis administration should be based on risk assessment, with chemical prophylaxis reserved for high risk patients, ideally with low molecular weight heparin (LOE 1). These guidelines serve as an important first step toward standardization of perioperative care in pediatric free tissue transfer to improve outcomes and minimize complications.