# A SYSTEMATIC REVIEW OF PERIOPERATIVE OUTCOMES IN ROBOTIC ASSISTED KIDNEY TRANSPLANTATION

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**Background:** With the advent and accessibility of robotics in surgery in general, RAKT(Robotic-assisted kidney transplantation) is increasingly offered to patients with ESRD. However, the overall advantages over conventional kidney transplants are still debatable.

**Objective:** This meta-analysis was undertaken to assess the difference in the perioperative outcomes of RAKT versus open Kidney transplantation (OKT).

**Methods:** Database search was performed following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement to identify studies on the effect of RAKT on surgery duration, kidney failure risk, operative blood loss, length of hospital stay, intraoperative complications, and postoperative complications. The snowball procedure was also used to extract relevant articles from the citations of some included studies. The Meta-analysis was performed, a random-effects method was applied, and the standard mean difference was used to compute the p-value and I2 value.

**Results:** 10 studies yielding 248 patients in the RAKT group and 750 patients in the OKT group were retained for analysis from 327 articles published between 2014 and 2021 that were generated from the database search and another snowballing. The differences in the functional outcomes were not significant across most studies. Of the intraoperative outcomes, pooled results revealed the warm ischemia time (WIT) (SMD = 0.15 [.03, .33], P= 0.11) and operating time (ORT) (SMD = 0.74[-0.01, 1.48], P=0.05) had no significant difference in the RAKT and OKT. The pooled rewarming time (RT), and total ischemia time (TIT) were, however, significantly higher in the RAKT compared to OKT, SMD=1.17[0.48, 1.85], P=0.0008 and SMD=0.87[0.29, 1.45], P=0.003 respectively, but there was no difference in pooled CIT SMD=0.37[0.13, 0.62], P=0.27. The blood loss, incision length and analgesics requirement were significantly lower in the RAKT condition compared to the OKT group at SMD=-0.56[-0.86,-0.27], P=0.0002, SMD=-4.38[-7.32, -1.43], P=0.004, and SMD=-5.75[-8.83, -2.67], P=0.0003 respectively. There was no significant difference for the evaluated postoperative outcome of drain time, and serum creatinine value, SMD=-0.81[-2.73,1.08], P=0.4, and SMD=0.03[-0.17,0.24],P=0.76 respectively, whereas the length of hospital stay and wound infections was smaller for RAKT SMD=-0.37 [-0.65,0.08], P=0.01, and OR 0.20 [0.06-0.62], P=0.006 respectively.

**Conclusion:** RAKT is a safe and feasible alternative to OKT with the advantages of less postoperative pain, a smaller length of incision, fewer wound infections, and a shorter length of hospital stay without compromising renal graft function and patient survival.

**Figure 1: CIT Forest Plot**

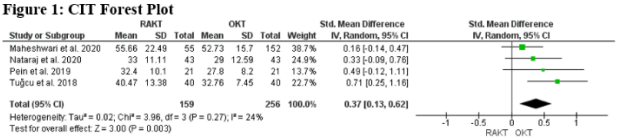



**Figure 2: WIT Forest Plot**

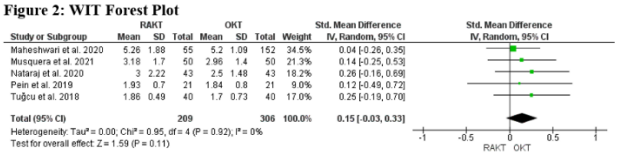



**Figure 3: RT Forest Plot**

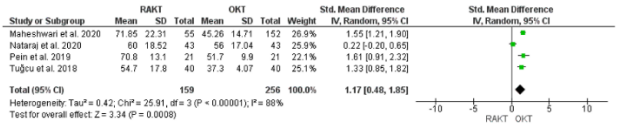



**Figure 4: TIT Forest Plot**

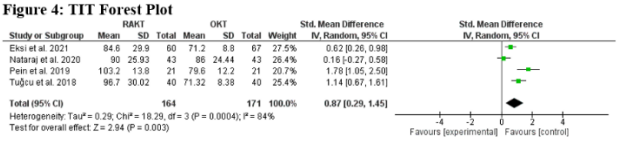



**Figure 5: Operating Time Forest Plot**

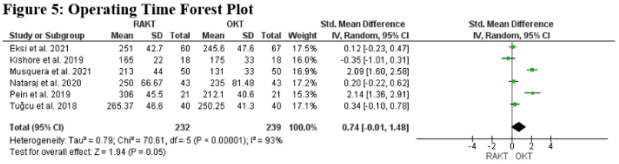



**Figure 6: Blood Loss Forest Plot**

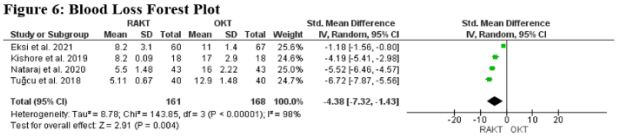



**Figure 7: Incision Length Forest Plot**

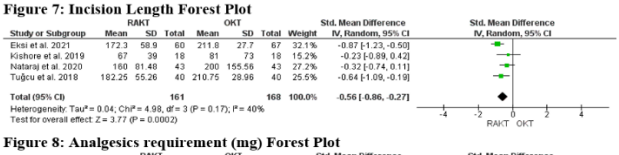



**Figure 8: Analgesics requirement (mg) Forest Plot**

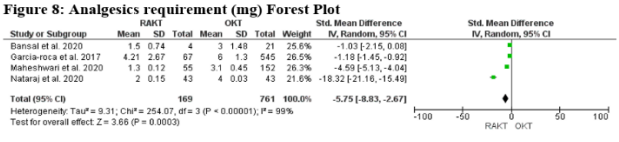



**Figure 9: Hospital Stay Forest Plot**

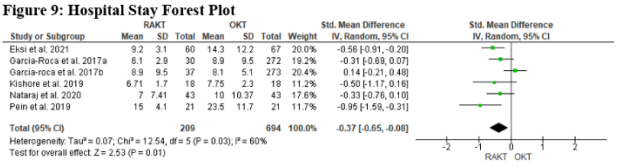



**Figure 10: Drain Time Forest Plot**

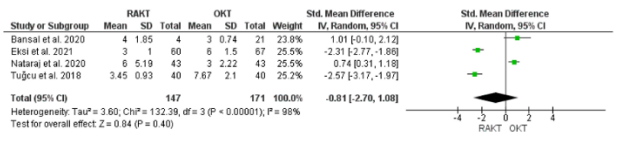
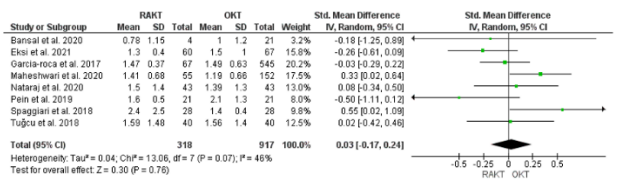
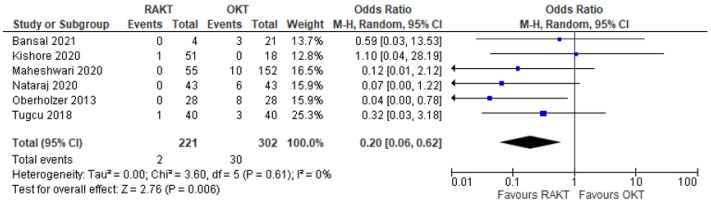



**Figure 11: Serum Creatinine Value Forest plot**



**Wound Infection**



# EQUIVALENCY OF SHORT-TERM PERIOPERATIVE OUTCOMES AFTER OPEN, LAPAROSCOPIC, AND ROBOTIC ILEAL ANAL POUCH ANASTOMOSIS: DOES PROCEDURE COMPLEXITY OVERRIDE OPERATIVE APPROACH?

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**Background:** Ileal anal pouch anastomosis (IPAA) is the treatment of choice for patients undergoing a proctocolectomy and desiring restoration of bowel continuity for chronic ulcerative colitis and familial adenomatous polyposis. This represents a technically complex operation associated with significant morbidity and may be performed by an open, laparoscopic, or robotic approach. However, there is paucity of data regarding the comparative perioperative outcomes between these three operative techniques outside of single institutional studies.

**Objective:** Compare 30-day clinical outcomes of patients undergoing IPAA by open, laparoscopic, or robotic approaches.

**Methods:** The NSQIP targeted proctectomy data set was used to identify patients who underwent IPAA between 2016 and 2019. Thirty-day outcomes between different surgical approaches were compared using univariate and multivariable analysis.

**Results:** During the study period, 1,067 open, 971 laparoscopic, and 341 robotic IPAA were performed. The most frequent indications were inflammatory bowel disease (63%), malignancy (17%), familial adenomatous polyposis (6%), and others (12%). Mean age of the cohort was 42 ±15 years with 43% females, and 76% of patients with a BMI less than or equal to 25 kg/m2. Mean length of stay was 7 days. The overall morbidity was 26.8% for the entire cohort with an approximate 4% anastomotic leak rate, 20% incidence of an ileus, 5.6% reoperation rate, and 20% readmission rate. After adjusting for available confounders, operative approach was not associated with any short-term outcomes, including: length of stay, reoperation, anastomotic leak, incidence of ileus, grade 1-2 or grade ≥3 complications, and 30-day readmission.

**Conclusion:** IPAA continues to be associated with significant postoperative morbidity regardless of operative approach. The patient related advantages in terms of perioperative outcomes for laparoscopic and robotic techniques compared to open surgery are less pronounced in complex operations such as IPAA.

Table 2: Univariate comparison of outcomes based on surgical approach.

| Characteristics | Approach | | | p-value |
|---|---|---|---|---|
| | *Open N=1067 (%)* | *Laparoscopy N= 971 (%)* | *Robotic N= 341 (%)* | |
| **Grade 1-2** | 154 (14.4) | 100 (10.3) | 39 (11.4) | 0.016 |
| **Deep Vein Thrombosis** | 14 (1.3) | 26 (2.7) | 4 (1.2) | 0.044 |
| Wound Disruption | 6 (0.6) | 2 (0.2) | 3 (0.9) | 0.233 |
| Renal Failure | 4 (0.4) | 4 (0.4) | 1 (0.3) | 0.954 |
| Clostridium Difficile Infection | 2 (0.2) | 1 (0.1) | 1 (0.3) | 0.746 |
| Sepsis | 44 (4.1) | 25 (2.6) | 13 (3.8) | 0.148 |
| Urinary Tract Infection | 34 (3.2) | 23 (2.4) | 12 (3.5) | 0.417 |
| Pneumonia | 9 (0.8) | 11 (1.1) | 4 (1.2) | 0.766 |
| **Superficial Incisional SSI** | 72 (6.7) | 20 (2.1) | 7 (2.1) | <0.001 |
| Grade ≥3 | 158 (14.8) | 134 (13.8) | 54 (15.8) | 0.622 |
| **Deep Wound Infection** | 18 (1.7) | 5 (0.5) | 3 (0.9) | 0.036 |
| Organ Space SSI | 90 (8.4) | 80 (8.2) | 28 (8.2) | 0.984 |
| Unplanned Intubation | 2 (0.2) | 6 (0.6) | 2 (0.6) | 0.285 |
| Pulmonary Embolism | 5 (0.5) | 2 (0.2) | 0 (0.0) | 0.306 |
| On Ventilator greater than 48 Hours | 2 (0.2) | 6 (0.6) | 2 (0.6) | 0.285 |
| Progressive Renal Insufficiency | 15 (1.4) | 16 (1.6) | 3 (0.9) | 0.587 |
| Stroke/CVA | 0 (0.0) | 1 (0.1) | 0 (0.0) | 0.484 |
| Cardiac Arrest | 1 (0.1) | 2 (0.2) | 1 (0.3) | 0.686 |
| Myocardial Infarction | 3 (0.3) | 1 (0.1) | 0 (0.0) | 0.442 |
| Septic Shock | 6 (0.6) | 10 (1.0) | 2 (0.6) | 0.442 |
| Reoperation | 53 (5.0) | 54 (5.6) | 27 (7.9) | 0.12 |
| Death | 2 (0.2) | 3 (0.3) | 1 (0.3) | 0.85 |
| Anastomotic Leak | 43 (4.0) | 41 (4.2) | 14 (4.1) | 0.976 |
| Ileus | 219 (20.5) | 201 (20.7) | 67 (19.6) | 0.916 |
| Readmission | 234 (21.9) | 199 (20.5) | 66 (19.4) | 0.532 |

# TEMPORAL TRENDS IN DONOR DEMOGRAPHICS AND PERIOPERATIVE OUTCOMES IN ROBOTIC DONOR NEPHRECTOMY

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**Background:** Due to the advantages of robotics over conventional laparoscopy, Robotic living donor nephrectomy (RLND) is increasingly being adopted for donor kidney harvest. The changes in the donor demographics and perioperative outcomes over different time eras are not well known.

**Objective:** This study was undertaken to determine the temporal trends in donor demographics and perioperative outcomes in RLDN

**Methods:** All living donors who underwent RLDN from March 2000 to March 2013 at the University of Illinois, Chicago, were included in this single-center retrospective study. The patient demographic and clinical characteristics were recorded. The focus of the study was perioperative surgical outcomes in terms of, operative time (ORT), warm ischemia time (WIT), estimated blood loss (EBL), length of stay (LOS) and complications, and readmission rate. The consecutive LDs (Living donors) were divided chronologically into four different groups corresponding to the four different epochs in time to assess the refinements in the surgical technique on the outcomes of RLDN. The clinical and surgical outcome variables were compared temporally, statistically examined, and drawn inferences. Categorical variables were compared using Chi-square or Fisher's Exact test, as appropriate, and continuous variables were compared between groups using analysis of one-way variance or Kruskal Wallis test for non-normal data. A p value $< 0.05$ was considered statistically significant All analysis was carried out using SAS 9.3 (SAS Institute, Cary, North Carolina, USA).

**Results:** A total of 800 consecutive donors underwent robotic-assisted donor nephrectomy. The mean donor age was 36±11.0 years, and there were more females than males. The BMI varied from 17-53kg/m2 with a mean BMI of 29.2± 5.7 Kg/m2, and 62.6% of donors were first-, degree relatives of the recipients. The proportion of left kidneys procured was 95.7%. Arterial anomalies were present in 26.1% of donors, while 2, 3, and 4 arteries were present in 22.4%, 2.3%, and 0.2%, respectively. Venous anomalies were present in 16 patients overall. Most procedures (98.8%) were conducted with robotic assistance. Five cases (0.6%) were converted to an open, while another 4 patients had another concurrent procedure during the robotic nephrectomy, as shown in table 1. From the year 2000-to 2013, a gradual increase in donor age was observed (p=0.01) (Table 2). There were no changes in the male to female ratio and the mean BMI temporally. Donations across all races increased significantly (p=0.03) except Hispanics. Statistically significant increases were noted in ORT (p

**Conclusion:** RLDN is a safe technique, which offers the advantages of a short learning curve and better ergonomics to facilitate donor surgery with safety despite wide variations in the donor characteristics and surgical experience.

| Variable | Value | No. of patients (N) |
|---|---|---|
| **Age (years), mean+/-SD** | 36.0±11.0 | 800 |
| **Sex, n (%)** | | 800 |
| **Male** | 378(47.2%) | |
| **Female** | 422(52.7%) | |
| **Race, n (%)** | | 800 |
| **White** | 190 (23.7%) | |
| **Black** | 302 (37.7%) | |
| **Hispanic** | 257 (32.1%) | |
| **Others** | 51 (6.3%) | |
| **Donor-recipient relation, n (%)** | | 800 |
| First-degree relative | 501 (62.6%) | |
| Second-degree relative | 71 (8.8%) | |
| Unrelated | 228 (28.5%) | |
| **Anthropometric measurements** | | |
| Weight (Kgs), mean+/-SD | 83.3±18.3 | 792 |
| Height (cms), mean+/-SD | 168.6± 10.3 | 767 |
| BMI (Kg/m$^2$), mean+/-SD | 29.2± 5.7 | 768 |
| **Predonation BP and Labs** | | |
| **Predonation SBP (mmHg), mean±SD** | 121.8±12.2 | 800 |
| **Predonation DBP (mmHg), mean±SD** | 73.8± 10.1 | 800 |
| **Predonation Creatinine (mg/dl), mean±SD** | 0.8±0.1 | 770 |
| **Predonation Blood glucose (units), mean+/-SD** | 90± 12 | 800 |
| **Anatomy** | | |
| Laterality of donated kidney, n (%) | | 798 |
| Left | 764 (95.7%) | |
| Right | 34 (4.2%) | |
| **Vascular anomalies, n (%)** | | |
| Arterial anomalies | 200 (26.14%) | 797 |
| Venous anomalies | 16 (2.13%) | 795 |
| **Both Arterial and venous** | 8 (1.0%) | 797 |
| **Number of arteries, n (%)** | | 797 |
| 1 | 597(74.9%) | |
| 2 | 179 (22.4%) | |
| 3 | 19 (2.3%) | |
| 4 | 2 (0.2%) | |
| **Number of veins, n (%)** | | 795 |
| 1 | 779(97.9%) | |
| 2 | 15(1.8%) | |
| 3 | 1 (0.1%) | |
| **Number of ureters, n (%)** | | 750 |
| 1 | 746 (99.4%) | |
| 2 | 4 (1.0%) | |

**Table 2: Temporal trends in donor demographics and outcomes.**

| Variable | Year (2000-2003) n=111 | Year (2004-2006) n=223 | Year (2007-2009) n=216 | Year (2010-2013) n=250 | P value |
|---|---|---|---|---|---|
| **Age (Mean±SD/No. of observations N** | 35.1±9.5(84) | 34.3±10.5(218) | 36.4±11.1(216) | 37.4±11.8(250) | **0.02*** |
| **Sex n (%) Male** | 56 (14.8) | 105 (27.7) | 103 (27.2) | 114 (30.1) | 0.86 |
| **Female** | 55 (13.0) | 118 (27.9) | 113 (26.8) | 136 (32.3) | |
| **BMI (Mean±SD)** | 28.8±5.8 | 29.0±6.2 | 29.2±5.6 | 29.5±5.4 | 0.43 |
| **Race n (%)** | | | | | **0.003*** |
| **White** | 27 (14.2) | 46(24.2) | 50 (26.3) | 67 (35.2) | |
| **Black** | 44 (14.5) | 91 (30.1) | 81 (26.8) | 86 (28.4) | |
| **Hispanics** | 36 (14.0) | 78 (30.3) | 76 (29.5) | 67 (26.0) | |
| **Others** | 4( 7.8)) | 8 (15.6) | 9 (17.6) | 30 (58.2) | |
| **OR time Median ± (IQR)** | 190.0± (145-215 | 120.0± (90-140) | 120.0 ± (105-162) | 165.0 ± (139.5-192.0) | <0.0001* |
| **EBL(mls) Median ± (IQR)** | 30±(30-30) | 50±(25-100) | 30±(20-50) | 40± (30-80) | <0.0001* |
| **WIT (secs) Median ± (IQR)time (Seconds)** | 90± (90-110) | 90± (90-100) | 120± (90-180) | 180± (180-240) | <0.0001* |
| **LOS Mean ±SD** | 2.2±1.0 | 2.5±0.9 | 3.3±1.1 | 3.2±1.1 | <0.0001* |
| **Immediate Postoperative complications n (%)** | | | | | <0.0001* |
| **Mild (Grade I,II)** | 17 (23.3) | 41 (56.2) | 9 (12.3) | 6 (8.2) | 0.0047* |
| **Moderate (Grade III)** | 6 (50) | 1 (8.3) | 2 (16.7) | 3 (25) | 0.0043* |
| **Severe (Grade IV,V)** | 0 (0.0) | 1 (100) | 0 (0) | 0 (0) | 1.0 |
| **Delayed Complications n (%)** | | | | | 0.18 |
| **Mild (Grade I,II)** | 0 (0) | 0 (0) | 0 (0) | 1 (100) | |
| **Moderate (Grade III)** | 2 (14.3) | 9 (64.3) | 2 (14.3) | 1 (7.1) | |
| **Severe (Grade IV,V)** | 1 (100) | 0 (0) | 0 (0) | 0 (0) | |
| **Readmissions** | 12 (13.8) | 18 (20.7) | 18 (20.7) | 39 (44.8) | 0.03* |

Abbreviations: SD: Standard deviation, IQR: Interquartile range, DSO: Duration of Surgery, WIT: Warm ischemia time, LOS: Length of hospital stay.

# PRIMARY PALMAR HYPERHIDROSIS AND THORACOSCOPIC SYMPATHECTOMY

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**Background:** Bilateral thoracoscopic sympathectomy (BTS) is an option for patients with severe primary palmar hyperhidrosis (PPH). Historically, evaluation of sympathectomy for palmar hyperhidrosis is almost entirely subjective.

**Objective:** This study was conducted to establish an objective approach to evaluate the severity of symptoms and sweat production in patients with primary palmar hyperhidrosis and assess their response to thoracoscopic sympathectomy.

**Methods:** We conducted two institutional review board-approved studies. We performed a one-time evaluation of healthy volunteers (controls) with three questionnaires (Hyperhidrosis Disease Severity Scale, Dermatology Life Quality Index, and Short Form-36) and measurement of transepidermal water loss (TEWL; g/m2/h). We evaluated PPH patients with these same tools before, 30 days after, and 1 year after BTS and compared them with controls.

**Results:** We evaluated 50 control healthy volunteers (ages 21-27, median age 24; 50% male, 50% female) and 127 PPH patients (ages 20-33, median age 25; 31.5% male, 68.5% female); 21 PPH patients underwent sympathectomy and the 1-month postoperative evaluation, and of those, 10 patients had a 1-year follow-up visit. Hyperhidrosis Disease Severity Scale and Dermatology Life Quality Index scores were higher in PPH patients than in controls ($p < 0.05$) but normalized after thoracoscopic sympathectomy. Short Form-36 scale scores were lower in PPH patients than controls ($p < 0.05$), but improved significantly after BTS. Compared with controls, preoperative TEWL values were significantly higher in PPH patients (palmar: 146.2 PPH vs 106.1 controls, $p < 0.05$; plantar: 87.7 PPH vs 55.5 controls, $p < 0.05$; axillary: 168.3 PPH vs 119.6 controls, $p < 0.0001$). After BTS, palmar TEWL were significantly lower in both the 1-month and 1-year evaluations (1-month palmar: 42.9, $p < 0.0001$; 1-year palmar: 28.1, p

**Conclusion:** Primary palmar hyperhidrosis should be objectively evaluated with standardized quality of life measures and TEWL measurements before and after treatment. We believe this objective practical approach provides a benchmark for clinical practice and research.

# STAPLELESS UNIPORTAL VIDEO-ASSISTED THORACOSCOPIC SURGERY FOR ANATOMIC LUNG RESECTIONS

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**Introduction/Objective:** Current VATS anatomic lung resections rely heavily on the use of staplers for vascular, bronchial and parenchymal transections. However, disposable staplers are expensive and have a large environmental footprint. The cost of disposables additionally pose a barrier to the widespread adoption of these minimally invasive techniques in underserved populations.

**Case Presentation:** We describe a staple-less technique for performing uniportal VATS right upper lobe S1 segmentectomy in a patient with a 1.5 cm ground glass opacity. We positioned our patient in lateral decubitus and confirmed lung isolation under general anesthesia. We made a 3 cm uniportal incision in the 5th intercostal space in the posterior axillary line. We dissected the V1a vein branch and ligated it. Next, we dissected the arterial branches of S1 taking great care to look for a recurrent A2 artery, ligated them, and transected them. This patient did not have a recurrent A2. We exposed the apical segmental bronchus (B1) and selectively inflated S1 using a bronchoscope and jet ventilation. Thereafter, we clipped B1 distally to trap air within the segment for clear delineation of the intersegmental plane. We divided the bronchus proximal to the clip and performed a bronchoplasty. We completed the segmentectomy by dividing the lung parenchyma along the inflation-deflation line with electrocautery. Finally, we reapproximated the visceral pleural along the intersegmental plane with running absorbable suture.

**Discussion:** We removed our patient's chest tube and discharged him home on postoperative day 1. There were no complications. Final pathology was moderately differentiated invasive adenocarcinoma, pT1aN0.

**Conclusion:** Staple-less VATS anatomic resection is technically feasible and was safe in this patient. We are expanding our experience with this technique with the aim to reduce cost, to offer VATS anatomic resection in underserved populations, and to reduce the environmental footprint of thoracic surgery.

# CENTRAL VENOUS AND WEDGE PRESSURES IN A PORCINE MODEL OF DISTRIBUTIVE HYPOTENSION AND RESUSCITATION

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**Background:** Pre-clinical models of sepsis and septic shock are critical to characterize response to resuscitation strategies, utility of novel devices and monitoring approaches, and determination of hemodynamic parameters. Though imperfect, a porcine model of lipopolysaccharide (LPS)-induced hypotension has been designed that decreased peripheral vascular resistance to approximate changes observed in sepsis. Little is reported on hemodynamic parameters during the course of sepsis and resuscitation.

**Objective:** In this study, we aimed to assess central venous pressure (CVP) and pulmonary capillary wedge pressure (PCWP) throughout induction of hypotension, with subsequent fluid and vasopressor-based resuscitation.

**Methods:** Ten pigs were anesthetized, cannulated with a pulmonary artery catheter and equilibrated to a PCWP of ~10 mmHg. Pigs were infused with an escalating dose of IV LPS until a 25% decrement in systolic blood pressure was observed. Four subsequent 10 mg/kg crystalloid boluses were given, followed by a 30 minute uptitration of norepinephrine (NE) to 0.25 ug/kg/min. Hemodynamic parameters including CVP and PCWP were transduced at baseline, critical hypotension, after each bolus, and after the course of NE administration. Central tendency was expressed as median [interquartile range]. Differences among medians were determined using Wilcoxon or Friedman tests with post-hoc multiple comparisons, as appropriate.

**Results:** From baseline to critical hypotension, PCWP (10 [9-10] mmHg vs. 8 [6-9] mmHg; P=0.02) significantly declined, unlike CVP (5 [4-6] mmHg vs. 3 [1-5] mmHg; P=0.14). Compared to its value at critical hypotension (8 [6-9] mmHg), PCWP was elevated after the second (12 [11-14] mmHg; P=0.01), third (13 [11-19] mmHg; P

**Conclusion:** Key intravascular blood volume parameters PCWP and CVP were assessed in a porcine model of LPS-induced hypotension and resuscitation to approximate sepsis. Changes in CVP mimicked those of PCWP, and both decreased after a course of NE infusion. These values obtained from controlled experiments provide context for use of these resuscitation strategies in humans with distributive hypotension, though further studies are needed.

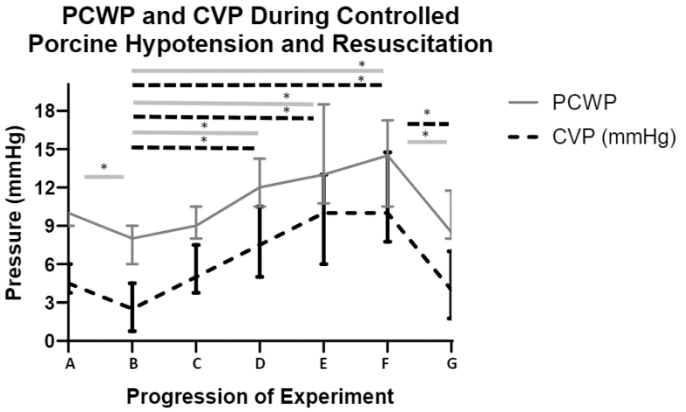


**Figure**- PCWP and CVP from baseline (A) to critical hypotension (25% decrement in systolic BP; B), followed by four subsequent 10 cc/kg boluses (C, D, E, F), and then 30 minute uptitration with norepinephrine (G; bars represent median and interquartile range; n=10, *P<0.05

# INCREASING MORTALITY IN V-V ECMO FOR COVID-19 ASSOCIATED ARDS

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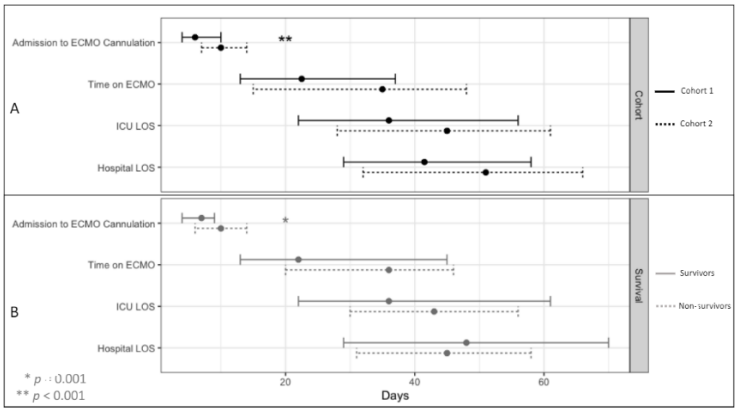
**Background:** Veno-venous extracorporeal membrane oxygenation (V-V ECMO) has been utilized as treatment for acute respiratory distress syndrome (ARDS) secondary to COVID-19 in select cases that are refractory to conventional treatment. We have previously reported our experience with a survival rate of 65% in patients treated with V-V ECMO for ARDS due to COVID-19, which is in line with other studies (1). Since publishing this work, new variants have emerged and therapeutic regimens have been established, both of which may affect outcomes in this population. We present an update to Minnesota's experience with V-V ECMO for ARDS due to COVID-19 by comparing 60-day mortality and patient and treatment characteristics between the first surge and the second surge of critically ill patients with this disease in our region.

**Objective:** Determine the factors associated with mortality in V-V ECMO patients with COVID-19 infection and provide an updated report of clinical outcomes for patients treated with V-V ECMO for COVID-19 in Minnesota.

**Methods:** A total of 100 patients treated with V-V ECMO for COVID-19 associated ARDS between March 1, 2020 and June 1, 2021 at the four adult Extracorporeal Life Support Organization (ELSO)-certified Centers of Excellence in Minnesota. The primary outcome was 60-day survival for patients treated with V-V ECMO for COVID-19. Outcomes of patients treated from November 2, 2020 to June 1, 2021(Cohort 2) were compared to a data from a previous cohort of patients, collected from March 1, 2020 to November 1, 2020 (Cohort 1). The data from both cohorts was merged into a single dataset (Combined Cohort).

**Results:** Survival on V-V ECMO due to COVID-19 associated ARDS significantly decreased after November 1, 2020 (63% vs 41%, p=0.026). The median interval from hospital admission to V-V ECMO cannulation was significantly associated with 60-day mortality (10 [6-14] days in non-survivors vs. 7 [4-9] days in survivors, p=0.001) in the Combined Cohort, and was also significantly longer in Cohort 2 than Cohort 1 (10 [7-14] days vs. 6 [4-10] days, p

**Conclusion:** There was a significant increase in mortality for patients treated with V-V ECMO for COVID-19 associated ARDS in Cohort 2 compared to Cohort 1. Further research is required to determine the cause of the worsening trend in mortality.



| Variables | | Non-Survivors (N=49) | Survivors (N=51) | *p*-value |
|---|---|---|---|---|
| Age | Median (N [IQR]) | 53 (47-57) | 50 (40-59) | 0.36 |
| Sex (N [%]) | Male | 39 (80) | 36 (71) | 0.30 |
| | Female | 10 (20) | 15 (29) | |
| Race (N [%]) | White | 24 (49) | 18 (35) | 0.15 |
| | Latino | 8 (16) | 17 (33) | |
| | Black | 5 (10) | 10 (20) | |
| | Native American | 3 (6) | 1 (2) | |
| | Asian | 8 (16) | 4 (8) | |
| BMI (N [SD]) | Mean | 31.5 (27.3-39.6) | 31.5 (26.9) | 0.49 |
| Medical History (N [%]) | Obesity | 27 (55) | 23 (45) | 0.32 |
| | Hypertension | 19 (39) | 13 (25) | 0.15 |
| | Hyperlipidemia | 15 (31) | 13 (25) | 0.57 |
| | Diabetes | 17 (35) | 15 (29) | 0.57 |
| | Asthma/COPD | 5 (10) | 6 (12) | 0.8 |
| | CAD | 5 (10) | 2 (4) | 0.22 |
| | CKD | 6 (12) | 5 (10) | 0.7 |
| | OSA | 5 (10) | 5 (10) | 0.95 |
| ECMO Location | Center #1 | 17 (35) | 8 (16) | 0.096 |
| | Center #2 | 16 (33) | 16 (31) | |
| | Center #3 | 8 (16) | 11 (22) | |
| | Center #4 | 8 (16) | 16 (31) | |
| | Transferred from Referral Hospital | 39 (80) | 32 (63) | 0.063 |
| Ventilator Settings (Average [STD]) | FiO2 | 90.6 (14.6) | 90.8 (13.7) | 0.97 |
| | PEEP | 13.0 (3.1) | 13.1 (3.4) | 0.9 |
| | Respiratory Rate | 24.6 (7.0) | 25.0 (7.1) | 0.81 |
| | Tidal Volume | 320.3 (138.9) | 325.2 (161.4) | 0.89 |
| | Peak Pressure | 31.1 (4.9) | 34.2 (6.3) | 0.057 |
| | Plateau Pressure | 30.2 (5.5) | 29.7 (5.3) | 0.75 |
| Arterial Blood Gas (Average [STD]) | pH | 7.3 (0.1) | 7.3 (0.1) | 0.66 |
| | PCO2 | 61.2 (20.1) | 65.3 (16.6) | 0.28 |
| | PaO2 | 57.5 (18.8) | 56.1 (14.7) | 0.68 |
| | P/F Ratio | 70.3 (28.0) | 74.2 (23.7) | 0.46 |
| Novel Therapeutics (N [%]) | Hydroxychloroquine +/- Azithromycin | 8 (16) | 15 (29) | 0.12 |
| | Remdesivir | 33 (67) | 26 (51) | 0.096 |
| | IL-6 Inhibitor | 18 (37) | 21 (41) | 0.65 |
| | Convalescent Plasma | 20 (41) | 26 (51) | 0.31 |
| | Steroids | 47 (96) | 39 (76) | **0.005** |
| | Total Steroid Days (median [IQR]) | 10 (9-14) | 9 (3-11) | **0.006** |
| Renal Failure | Need for Renal Replacement (N [%]) | 29 (59) | 20 (39) | **0.046** |
| | Total Renal Replacement, days (Average [STD]) | 22 (15.7) | 21.7 (16.2) | 0.94 |
| Transfusions (Average [SE]) | Total Units | 15 (9-25) | 7 (3-17) | **<0.001** |
| SOFA Score (Average [STD]) | Prior to ECMO Cannulation | 7 (6-9) | 7 (4-8) | 0.14 |
| ICU Treatments (N [%]) | Proned | 47 (96) | 42 (82) | **0.03** |
| | Paralyzed | 45 (92) | 46 (90) | 0.77 |
| | Vasopressor | 34 (69) | 34 (67) | 0.77 |

| Variables | | Cohort 1 (N=49) | Cohort 2 (N=51) | *p*-value |
|---|---|---|---|---|
| Age | Median (N [IQR]) | 53 (48-57) | 52 (43-59) | 0.73 |
| Sex (N [%]) | Male | 38 (83) | 37 (69) | 0.10 |
| | Female | 8 (17) | 17 (31) | |
| Race (N [%]) | White | 11 (24) | 31 (57) | **0.004** |
| | Latino | 17 (37) | 8 (15) | |
| | Black | 10 (22) | 5 (9) | |
| | Native American | 1 (2) | 3 (6) | |
| | Asian | 7 (15) | 5 (9) | |
| BMI (N [SD]) | Mean | 30.4 (27.8-35.5) | 32.1 (26.3-37.4) | 0.86 |
| Medical History (N [%]) | Obesity | 18 (39) | 32 (59) | **0.045** |
| | Hypertension | 21 (46) | 11 (20) | **0.007** |
| | Hyperlipidemia | 13 (28) | 15 (28) | 0.96 |
| | Diabetes | 18 (39) | 14 (26) | 0.16 |
| | Asthma/COPD | 3 (7) | 8 (15) | 0.19 |
| | CAD | 3 (7) | 4 (7) | 0.86 |
| | CKD | 6 (13) | 5 (9) | 0.55 |
| | OSA | 6 (13) | 4 (7) | 0.35 |
| ECMO Location | Center #1 | 12 (26) | 13 (24) | 0.81 |
| | Center #2 | 16 (35) | 16 (30) | |
| | Center #3 | 9 (20) | 10 (19) | |
| | Center #4 | 9 (20) | 15 (28) | |
| | Transferred from Referral Hospital | 27 (59) | 44 (81) | **0.012** |
| Ventilator Settings (Average [STD]) | FiO2 | 89.0 (14.4) | 92.1 (13.7) | 0.28 |
| | PEEP | 13.7 (3.4) | 12.4 (2.9) | **0.046** |
| | Respiratory Rate | 25.9 (6.3) | 23.8 (7.5) | 0.17 |
| | Tidal Volume | 281.4 (181.7) | 362.5 (101.5) | **0.017** |
| | Peak Pressure | 34.2 (5.0) | 32.2 (6.4) | 0.24 |
| | Plateau Pressure | 30.0 (4.4) | 29.8 (6.2) | 0.88 |
| Arterial Blood Gas (Average [STD]) | pH | 7.3 (0.1) | 7.3 (0.1) | 0.22 |
| | PCO2 | 62.2 (15.9) | 64.2 (20.6) | 0.61 |
| | PaO2 | 56.5 (14.7) | 57.1 (18.6) | 0.87 |
| | P/F Ratio | 72.3 (22.7) | 72.2341 (28.7) | 0.99 |
| Novel Therapeutics (N [%]) | Hydroxychloroquine +/- Azithromycin | 9 (20) | 14 (26) | 0.45 |
| | Remdesivir | 31 (67) | 28 (52) | 0.12 |
| | IL-6 Inhibitor | 26 (57) | 13 (24) | **<0.001** |
| | Convalescent Plasma | 22 (48) | 24 (44) | 0.74 |
| | Steroids | 33 (72) | 53 (98) | **<0.001** |
| | Total Steroid Days (median [IQR]) | 6 (0-10) | 11 (10-14) | **<0.001** |
| Renal Failure | Need for Renal Replacement (N [%]) | 21 (46) | 28 (52) | 0.54 |
| | Total Renal Replacement, days (Average [STD]) | 21.9 (16.0) | 21.9 (15.8) | 1 |
| Transfusions (Average [SE]) | Total Units | 11 (4-18) | 11 (5-22) | 0.9 |
| SOFA Score (Average [STD]) | Prior to ECMO Cannulation | 7 (6-8) | 7 (2-8) | 0.15 |
| ICU Treatments (N [%]) | Proned | 41 (89) | 48 (89) | 0.97 |
| | Paralyzed | 42 (91) | 49 (91) | 0.92 |
| | Vasopressor | 33 (72) | 35 (65) | 0.46 |

**OUTCOMES OF INTERFACILITY ECMO TRANSFERS**

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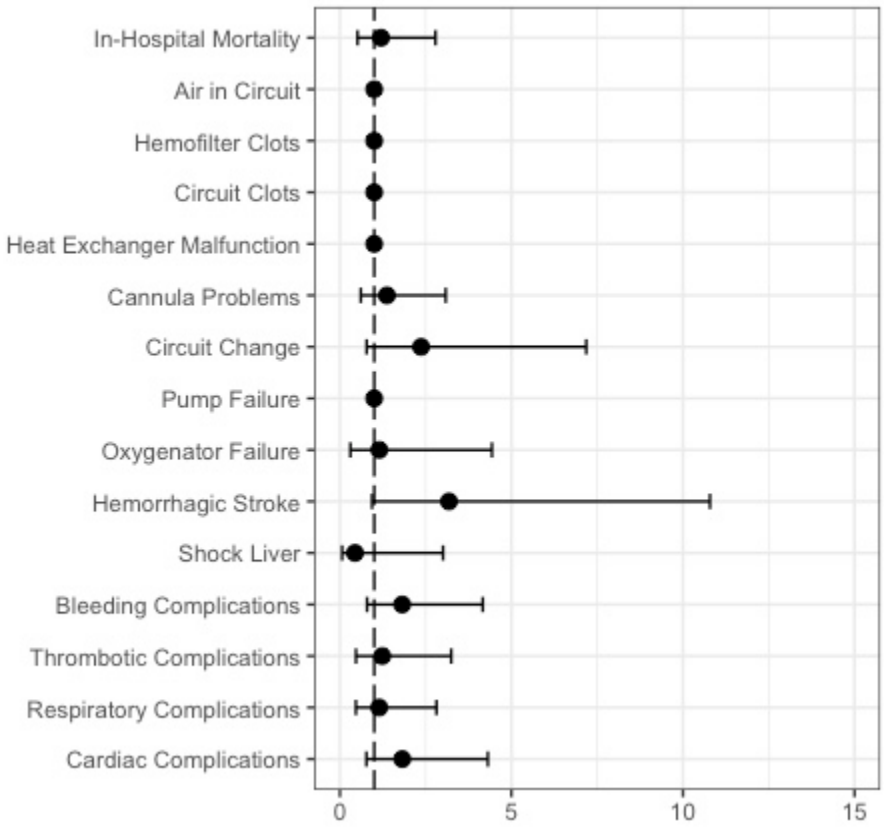
**Background:** As the use of extracorporeal membrane oxygenation (ECMO) expands, so has the need for interfacility transfer to ECMO Centers. However, the impact of these transfers on complication rates and mortality has not been fully studied.

**Objective:** We evaluated complications and outcomes in adult patients treated with venovenous (V-V) ECMO based on location of cannulation and mode of transport.

**Methods:** This is a retrospective study of adult patients treated with V-V ECMO at our institution from 2013-2020. Patients were analyzed based on location of cannulation (i.e., our hospital versus outside hospital). There was a sub-analysis performed on the patients transported on ECMO comparing the mode of transportation (i.e., ground vs air). Complications and in-hospital mortality were evaluated using logistic regression with results reported using odds ratios with confidence intervals.

**Results:** The study included 102 adult patients, 57% of which were cannulated at an outside institution prior to transfer. Of these, 60% were transported by ground and the remainder were transported by air. Risk adjusted logistic regression did not reveal any significant increase in odds for medical or equipment complications or mortality between the groups based on location of cannulation or mode of transport.

**Conclusion:** This study supports the practice of interfacility ECMO transfer but also highlights the need for refinement of protocols for adult patients transferred on V-V ECMO.



# LONGITUDINAL ANALYSIS OF STAIR-RELATED UPPER EXTREMITY FRACTURES IN THE ELDERLY: HIGH FEMALE INCIDENCE AND THE RISK OF HOSPITALIZATION BY FRACTURE TYPE

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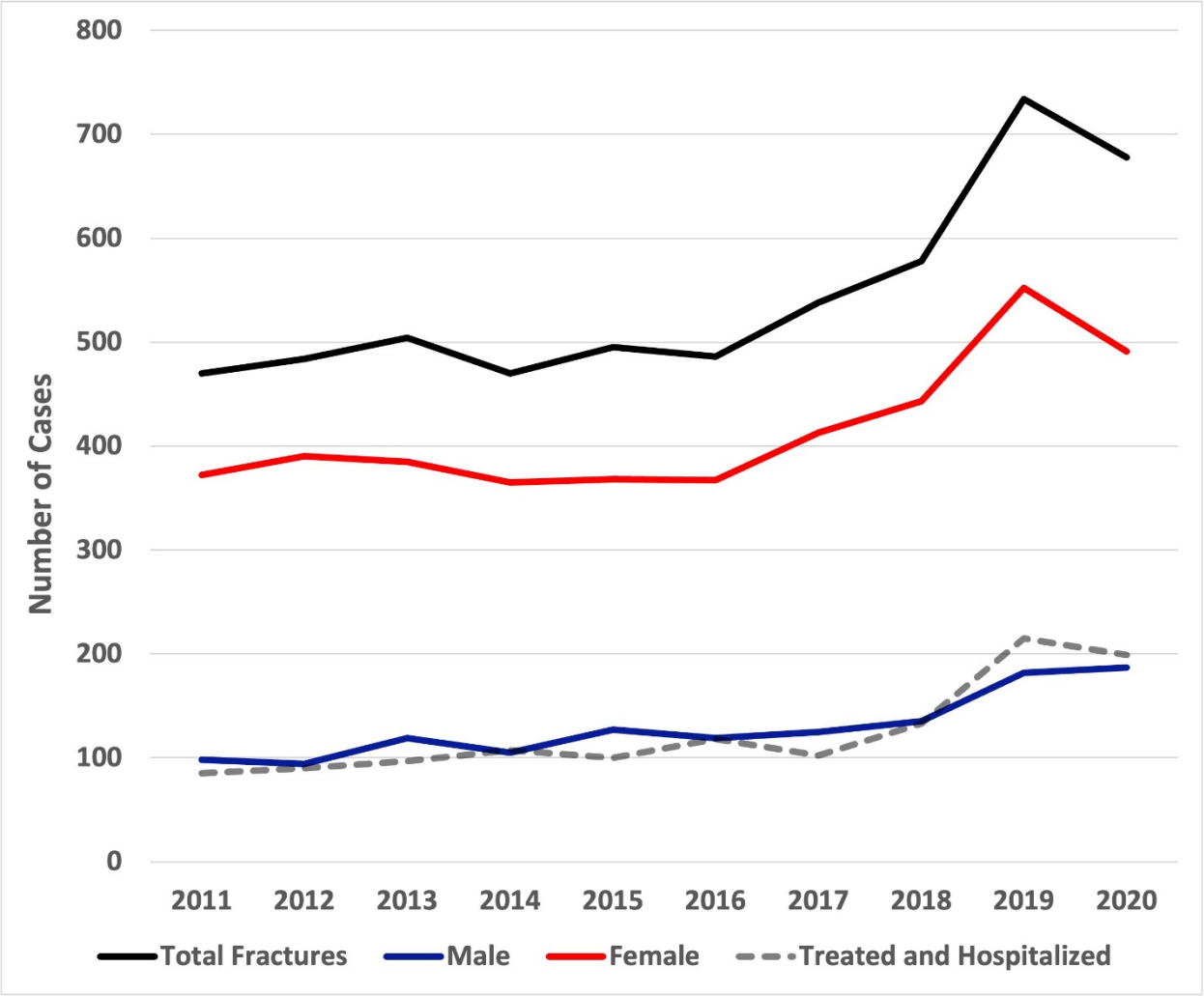
**Background:** Falls among patients 65 years and older are associated with marked increase in hospitalization, morbidity, mortality, and costs. Nearly one third of adults among this age group experience a fall at least once per year, and half of these adults will experience a second fall. Upper extremity fractures are one of the most prevalent age-related fractures and stair-associated falls are a common mechanism. As the US elderly population continues to grow, age-related injuries are likely to follow.

**Objective:** We aimed to quantify US emergency department trends in upper extremity stair-related fractures among the elderly to understand key factors associated with these trauma injuries.

**Methods:** We queried for all stair-related injuries National Electronic Injury Surveillance System (NEISS) between 2011 and 2020 among patients 65 years or older. We collected patient demographics, anatomic injury location, diagnosis, location of incident, and disposition data. Descriptive analysis was applied to characterize injury type through quantitative and qualitative methods. Univariate regression analysis was performed to identify trends in upper extremity fracture and hospitalization rates by year of injury. A secondary analysis was performed on upper extremity fractures and hospitalization rates based on sex of patients and location of injury. The US Census Bureau International Database (IDB) was analyzed to assess changes in the population within our age cohort during the study period.

**Results:** Analysis of the NEISS database resulted in an estimate of 2,441,748 (95%CI: 2,075,606-2,807,890) stair-related injuries in individuals aged 65 and older between 2011 to 2020: upper extremity (18.6%), head and neck (35%), lower extremity (24.3%). The size of the study cohort increased 6.1% based on the US Census IDB population assessments. The most common injuries were fractures (32.9%), visceral injuries (17.5%), and contusions or abrasions (15.7%). The most common fracture location was upper extremity(UE) with 244,299 patients (95%CI: 208,160-280,437). Fractures of the arm accounted for the majority of upper extremity fractures (27%), followed by the wrist (26%), shoulder (18%), forearm (14%), elbow (7%), finger (5%), and hand (4%). We found a significant increase in the number of reported upper extremity fractures, with an overall 52.7% increase in UE fractures (R2=0.74, p

**Conclusion:** Stair-related fractures among the elderly are increasing at a significantly higher rate than the population increase seen in this age cohort. The rate of upper extremity fractures is increasing, and the associated severity of injury requiring hospitalization is similarly increasing. Upper extremity stair-related fractures occur primarily at home and mostly among women. A percentage of these injuries are likely preventable through an optimal assessment of fall risk among elderly patients, the promotion of better bone health, and allocation of additional resources to “fall-proof” homes for elderly individuals at risk for stair-related injuries. We hypothesize that the increased hospitalization rates for stair-related upper extremity fractures may be confounded by associated injuries as the surgical literature reports a significant increase in hospitalization rates for patients with fractures of the upper thorax (Coary et. al) and the orthopedic literature reports increased operative care for upper extremity fractures during our study period (Patel et. al).




| Variable | Odds Ratio | 95% CI | P value |
|---|---|---|---|
| **Sex** | | | |
| Male | 1.34 | 1.16-1.55 | <0.0001 |
| **Fracture** | | | |
| Shoulder | 1.64 | 1.4-1.91 | <0.0001 |
| Arm | 1.52 | 1.33-1.75 | <0.0001 |
| Elbow | 1.36 | 1.08-1.72 | 0.0082 |

# A NATIONWIDE ANALYSIS OF CARE DELIVERY TO AMERICAN INDIANS AND ALASKA NATIVES WITH NON-SMALL CELL LUNG CANCER

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**Background:** Relative to non-Hispanic Whites (NHW), American Indians and Alaska Natives (AI/AN) experience a high incidence of non-small cell lung cancer (NSCLC) diagnoses, and suffer a disproportionate burden of mortality from the disease. Current guidelines recommend anatomic resection of operable stage I NSCLC, however rates of resection differ between NHW and AI/AN patients.

**Objective:** We evaluate factors associated with receipt of guideline-concordant care in AI/AN and NHW patients with stage I NSCLC, and describe the relationship between guideline concordant care and survival outcomes in these populations.

**Methods:** We performed a retrospective review of the National Cancer Database (NCDB), evaluating Non-Hispanic White (NHW) and American Indian / Alaskan Native (AI/AN) patients diagnosed with Stage 1 NSCLC between 2004-2017. Adherence to standard of care management for NSCLC was evaluated in NHW and AI/AN populations. Survival as a function of treatment strategy was evaluated using Kaplan Meier and Cox proportional hazards modeling.

**Results:** 196,349 patients with NSCLC were identified from the NCDB, 2004-2017. 195,736 were NHW, 613 were AI/AN. AI/AN were diagnosed at a younger median age than NHW (67 vs 70 years of age). Compared to NHW, AI/AN were more frequently younger (40% vs 28% 18-64 years of age; $p \leq 0.05$), had more comorbidities (21% vs 18% CCI >1; $p \leq 0.05$), more frequently lived in rural locations (14% vs 5%; $p \leq 0.05$), were more likely to have squamous cell carcinoma (38% vs 34%; $p \leq 0.05$), and more likely to not have surgery (37% vs 34%; $p \leq 0.05$) (Table 1). AI/AN race was independently associated with decreased likelihood of receiving surgery (OR 0.74, CI 95% 0.62-0.89) (Table 2). There was no significant difference in the hazard of death of patients managed operative or non-operatively, when stratified by race (Figure 1). When controlling for patient factors, adenocarcinoma histology, “other” histology, and the presence of multiple comorbidities (CCI 3) were significantly associated with increased hazard of death in patients managed nonoperatively (Table 3).

**Conclusion:** AI/AN populations are less likely to receive guideline concordant treatment for Stage I NSCLC. Targeted efforts are needed to better define the cause for this disparity and to optimize the care of early stage lung cancer in these populations.

| | All | | Non-Hispanic Whites | | American Indians/Alaska Natives | |
|---|---|---|---|---|---|---|
| | N= 196349 | | N= 195736 | | N= 613 | |
| | n | % | n | % | n | % |
| Median Age (years) | 70 | | 70 | | 67 | |
| Sex | | | | | | |
| Male | 91537 | 47% | 91254 | 47% | 283 | 46% |
| Female | 104812 | 53% | 104482 | 53% | 330 | 54% |
| Year of Diagnosis | | | | | | |
| 2004-2010 | 87772 | 45% | 87536 | 45% | 236 | 39% |
| 2011-2017 | 108577 | 55% | 108200 | 55% | 377 | 62% |
| Age at Diagnosis | | | | | | |
| 18-64 | 54679 | 28% | 54434 | 28% | 245 | 40% |
| 65-75 | 75126 | 38% | 74901 | 38% | 225 | 37% |
| 75+ | 66544 | 34% | 66401 | 34% | 143 | 23% |
| Rural/Urban Status | | | | | | |
| Urban | 186295 | 95% | 185766 | 95% | 529 | 86% |
| Rural | 10054 | 5% | 9970 | 5% | 84 | 14% |
| CCI | | | | | | |
| 0 | 97861 | 50% | 97571 | 50% | 290 | 47% |
| 1 | 63139 | 32% | 62945 | 32% | 194 | 32% |
| 2 | 24671 | 13% | 24584 | 13% | 87 | 14% |
| 3 | 10678 | 5% | 10636 | 5% | 42 | 7% |
| Grade | | | | | | |
| I | 25859 | 13% | 25779 | 13% | 80 | 13% |
| II | 71503 | 36% | 71277 | 36% | 226 | 37% |
| III | 54855 | 28% | 54682 | 28% | 173 | 28% |
| IV | 1039 | 1% | 1035 | 1% | 4 | 1% |
| 9 (cell type not determined, not stated, not applicable) | 43093 | 22% | 42963 | 22% | 130 | 21% |
| Number of nodes examined | | | | | | |
| Less than 15 | 91653 | 47% | 91,389 | 47% | 264 | 43% |
| 15+ | 20860 | 11% | 20,796 | 11% | 64 | 10% |
| No Nodes Examined | 73588 | 37% | 73,336 | 37% | 252 | 41% |
| Unknown | 10248 | 5% | 10,215 | 5% | 33 | 5% |
| Pathology | | | | | | |
| Squamous Cell Carcinoma | 66754 | 34% | 66522 | 34% | 232 | 38% |
| Adenocarcinoma | 108130 | 55% | 107811 | 55% | 319 | 52% |
| Other | 21465 | 10% | 21403 | 11% | 62 | 10% |
| Surgery | | | | | | |
| No | 65778 | 34% | 65552 | 33% | 226 | 37% |
| Lobectomy resection | 107816 | 55% | 107498 | 55% | 318 | 52% |
| Wedge resection | 22755 | 12% | 22686 | 12% | 69 | 11% |
| Treatment categories | | | | | | |
| No treatment | 15923 | 8% | 15875 | 8% | 48 | 8% |
| Chemo and/or radiation | 49855 | 25% | 49677 | 25% | 178 | 29% |
| Wedge no adjuvant treatment | 19830 | 10% | 19773 | 10% | 57 | 9% |
| Wedge with adjuvant treatment | 2925 | 1% | 2913 | 1% | 12 | 2% |
| Lobectomy no adjuvant treatment | 93443 | 48% | 93168 | 48% | 275 | 45% |
| Lobectomy with adjuvant treatment | 14373 | 7% | 14330 | 7% | 43 | 7% |

Table 1: Characteristics of American Indian / Alaska Native and Non-Hispanic White patients with overall stage 1 Non-small cell lung cancer, from the NCDB, 2004-2017. N=196,349

| | OR | 95% CI | |
|---|---|---|---|
| Race | | | |
| Non-Hispanic White | REF | | |
| AI/AN | 0.74 | 0.62 | 0.89 |
| Sex | | | |
| Male | REF | | |
| Female | 1.09 | 1.06 | 1.11 |
| Age | | | |
| 18-64 | REF | | |
| 65-74 | 1.62 | 1.58 | 1.66 |
| 75+ | 3.28 | 3.19 | 3.37 |
| Nodal Status | | | |
| <15 | REF | | |
| >15 | 3.13 | 3.00 | 3.28 |
| Unknown | 0.06 | 0.05 | 0.06 |
| Histology | | | |
| Squamous Cell Carcinoma | REF | | |
| Adenocarcinoma | 0.70 | 0.69 | 0.72 |
| Other | 3.13 | 3.00 | 3.28 |
| CCI | | | |
| 0 | REF | | |
| 1 | 0.92 | 0.90 | 0.942 |
| 2 | 1.15 | 1.12 | 1.19 |
| 3 | 1.64 | 1.57 | 1.72 |
| Academic status | | | |
| Academic | REF | | |
| Community | 0.87 | 0.85 | 0.89 |
| Urban/Rural Status | | | |
| Urban | REF | | |
| Rural | 1.02 | 0.87 | 1.20 |

Table 2: Odds of undergoing surgery, American Indian/Alaska Native patients and Non-Hispanic White patients with Stage I Non-small cell lung cancer, NCDB 2004-2017, N=196,349.

| | | With surgery | | | Without surgery | | |
|---|---|---|---|---|---|---|---|
| | | HR | 95% CI | P value | HR | 95% CI | P value |
| Race | | | | | | | |
| | NHW | Ref | | | Ref | | |
| | AI/AN | 1.06 | 0.93-1.22 | 0.38 | 1.17 | 0.96-1.43 | 0.12 |
| Sex | | | | | | | |
| | Male | Ref | | | Ref | | |
| | Female | 1.02 | 1.00-1.03 | 0.02 | 1.00 | 0.97-1.02 | 0.7391 |
| Age | | | | | | | |
| | 18-64 | Ref | | | Ref | | |
| | 65-74 | 1.01 | 0.99-1.02 | 0.40 | 1.01 | 0.98-1.04 | 0.66 |
| | 75+ | 0.96 | 0.94-0.98 | <.0001 | 1.00 | 0.97-1.03 | 0.75 |
| Nodal Status | | | | | | | |
| | <15 | Ref | | | | | |
| | >15 | 1.14 | 1.12-1.16 | <.0001 | | | |
| | Unknown | 0.93 | 0.90-0.96 | <.0001 | | | |
| Histology | | | | | | | |
| | Squamous Cell Carcinoma | Ref | | | Ref | | |
| | Adenocarcinoma | 1.04 | 1.02-1.06 | <.0001 | 1.03 | 1.00-1.06 | 0.03 |
| | Other | 0.84 | 0.80-0.87 | <.0001 | 0.87 | 0.83-0.90 | <.0001 |
| CCI | | | | | | | |
| | 0 | Ref | | | Ref | | |
| | 1 | 0.97 | 0.95-0.984 | 0.0001 | 0.95 | 0.92-0.972 | <.0001 |
| | 2 | 0.99 | 0.97-1.02 | 0.65 | 1.01 | 0.97-1.05 | 0.62 |
| | 3 | 1.16 | 1.11-1.21 | <.0001 | 1.14 | 1.09-1.21 | <.0001 |
| Academic status | | | | | | | |
| | Academic | Ref | | | Ref | | |
| | Community | 1.01 | 0.99-1.02 | 0.51 | 0.99 | 0.96-1.01 | 0.27 |
| Urban/Rural Status | | | | | | | |
| | Urban | Ref | | | Ref | | |
| | Rural | 1.05 | 1.01-1.08 | 0.01 | 1.05 | 1.00-1.10 | 0.08 |

Table 3: Hazard of death by receipt of surgery for American Indian / Alaska Native and Non-Hispanic White patients with Stage I non-small cell lung cancer. NCBD 2004-2017. N=196,349

Figure 1a: Overall survival in months, American Indian / Alaska Native and Non-Hispanic White patients with stage I non-small cell lung cancer, all treatments. From the NCDB, N=196,349. P=0.04

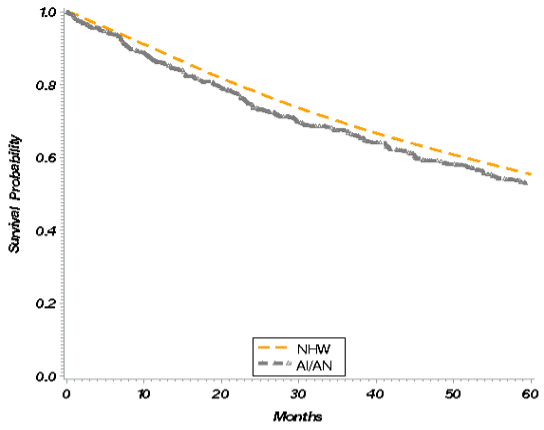
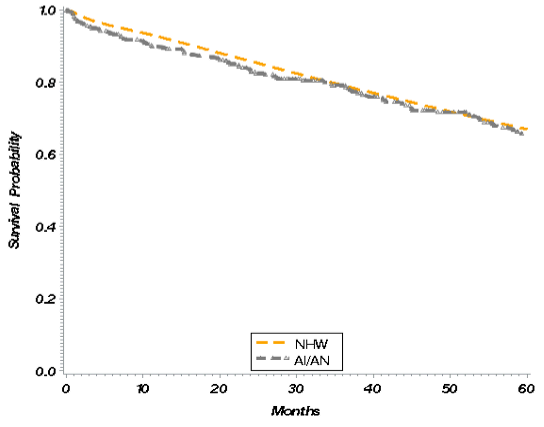



Figure 1b: Overall survival in months, American Indian / Alaska Native and Non-Hispanic White patients with stage I non-small cell lung cancer, who underwent any surgery. From the NCDB, N=130,571. P=0.2



# A NATIONWIDE ANALYSIS OF DISPARITIES IN POST-MASTECTOMY RECONSTRUCTION FOR AMERICAN INDIAN AND ALASKA NATIVE WOMEN

McKenzie J White, Saranya Prathibha, Corinne Praska, Jacob S Ankeny, Christopher J LaRocca, Eric H Jensen, Todd M Tuttle, Jane YC Hui, Schelomo Marmor, University of Minnesota

**Background:** Disparities in breast cancer care between Non-Hispanic White (NHW) and American Indian/Alaska Native (AI/AN) patients include lower rates of breast-conserving therapy (BCT), higher rates of mastectomy for early-stage cancers, and lower rates of post-mastectomy reconstruction (PMR) among AI/AN. Factors contributing to low rates of PMR for AI/AN are not well described.

**Objective:** Our aim was to evaluate differences between AI/AN and NHW with respect to receipt of PMR.

**Methods:** A retrospective review of the National Cancer Database from 2004-2017 was performed. We compared AI/AN and NHW patients with stage I-III invasive breast cancer, ages 18-64, who underwent mastectomy (unilateral [UM] or contralateral-prophylactic [CPM]). Exclusion criteria were diagnosis of ductal carcinoma in situ or lobular carcinoma in situ, and receipt of BCT. We compared annual reconstruction rates among the two groups using the Cochran–Armitage test. Factors associated with reconstruction were observed using multivariable logistical regression.

**Results:** During the study period, 337,094 women met inclusion criteria – 335,404 (99%) NHW and 1,690 (1%) AI/AN. AI/AN underwent UM more frequently than NHW (69% vs 60%; $p \leq 0.05$). Overall, the PMR rate was significantly lower for AI/AN than NHW (26% vs 48%; $p \leq 0.05$). Relative to NHW, AI/AN undergoing reconstruction were more likely to be younger (40% vs 32% 18-44 years old; $p \leq 0.05$), to have comorbidities (16% vs 9% CCI ≥ 1; $p \leq 0.05$), to reside in a rural location (5% vs 1%; $p \leq 0.05$), to travel farther for treatment (14.4 miles vs 11.2 miles; $p \leq 0.05$), to receive care at a community facility (80% vs 70%; $p \leq 0.05$), and to have government insurance (28% vs 9%; $p \leq 0.05$). Rates of UM were similar between AI/AN and NHW undergoing reconstruction (45% vs 44%; $p=0.81$). From 2004-2017, yearly rates of reconstruction increased, from 10% to 43% for AI/AN and from 23% to 56% for NHW, but remained persistently lower for AI/AN. After controlling for patient, disease, and treatment facility factors, AI/AN were significantly less likely to receive reconstruction than NHW (OR 0.62, CI 0.55-0.69). Among AI/AN, factors associated with decreased likelihood of reconstruction included later age at diagnosis (45-64 years old), positive lymph nodes, tumor >5 cm, government insurance, and receipt of radiation ($p \leq 0.05$). Among AI/AN, receipt of CPM was associated with increased likelihood of reconstruction (OR 2.45, CI 1.91-3.1).

**Conclusion:** AI/AN with stage I-III invasive breast cancer undergo PMR at a significantly lower rate than do NHW. We present the first nationwide analysis of factors contributing to this disparity. Although rates of PMR for AI/AN have improved over time, the use of reconstruction is still much lower than for NHW. The Women's Health and Cancer Rights Act of 1998 requires all group health plans covering mastectomy to also cover prostheses and reconstruction. More effort is needed to eliminate health care access barriers for women desiring reconstruction, independent of race, socio-economic, or demographic characteristics. This may require augmentation of programs to coordinate complex cancer care delivery to AI/AN.

# CHEMOTHERAPY REFUSAL AND SUBSEQUENT SURVIVAL IN OLDER WOMEN WITH HIGH GENOMIC RISK ESTROGEN-RECEPTOR POSITIVE BREAST CANCER

McKenzie White, Saranya Prathibha, Madison Kolbow, Corinne Praska, Jacob Ankeny, Christopher LaRocca, Eric Jensen, Todd Tuttle, Schelomo Marmor, Jane Yuet Ching Hui, University of Minnesota

**Background:** Patients with estrogen receptor (ER)- positive breast cancer and high-risk 21-gene recurrence score (RS) assay results benefit from chemotherapy, however some patients choose to decline chemotherapy. We evaluated factors associated with chemotherapy refusal by older women with high RS breast cancer and investigated the association of chemotherapy refusal with mortality.

**Objective:** To evaluate factors associated with chemotherapy refusal by older women with high RS breast cancer and investigate the association of chemotherapy refusal with mortality.

**Methods:** We used the National Cancer Database (2010-2017) to retrospectively identify women aged ≥65 years with ER-positive, HER2-negative, high RS (≥26) breast cancer. Women with Charlson Comorbidity Index ≥1, stage III or IV disease, or any unknown variables were excluded. Women with high RS who refused chemotherapy were compared to women with high RS who received chemotherapy. Refusal trends were analyzed using the Cochrane Armitage test. Factors associated with chemotherapy refusal were evaluated with a multivariable regression model. Overall survival (OS) by age and by treatment were evaluated with Kaplan-Meier and Cox proportional hazards modeling.

**Results:** 6827 women met study criteria; 5449 (80%) received chemotherapy and 1378 (20%) refused. Relative to those who received chemotherapy, those who refused chemotherapy were older (median age 71 vs 69 years; p

**Conclusion:** Among healthy women aged ≥65 with high genomic risk ER-positive breast cancer, chemotherapy refusal increased with increasing age. Chemotherapy refusal was significantly associated with decreased OS in women aged 65-79, but did not impact OS in women aged ≥80. Lower use of chemotherapy in women ≥80 may demonstrate pragmatic decision-making between physicians and patients. Furthermore, the routine use of genomic assays may not be appropriate in this age group. More research is needed to determine why women aged 65-79 refuse chemotherapy, and whether patients remain satisfied with these choices.

# THE EFFECTS OF HER2 POSITIVITY ON INVASIVE LOBULAR CARCINOMA OF THE BREAST

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**Background:** Invasive lobular carcinoma (ILC) has been shown to be less chemo-responsive with poorly described survival rates compared to invasive ductal cancer (IDC). HER2 positivity is rare but does occur in the setting of ILC.

**Objective:** We sought to determine the effects of HER2 positivity on oncologic outcomes in breast cancer patients with ILC.

**Methods:** Patients with stage I-III HER2+ ILC and IDC were identified from the National Cancer Database (2010-2017) and compared using Pearson's chi-squared test, Cochrane Armitage test for trend, and a logistic regression model by tumor, patient, and treatment characteristics. Overall survival was analyzed with the Kaplan-Meier method and a Cox proportional hazard model that included age, race, Charlson comorbidity index (CCI), year of diagnosis, tumor stage, tumor grade, progesterone receptor positivity, and treatment (chemotherapy, radiation).

**Results:** We identified 4798 patients with HER2+ ILC and 134904 with HER2+ IDC. Compared to patients with IDC, patients with ILC were older (≥65 years 46% vs IDC 29%, p

**Conclusion:** HER2+ ILC confers a worse prognosis than HER2+ IDC despite having lower tumor grades and increased ER and PR positivity. Unlike for HER2- ILC and similar to HER2+ IDC, chemotherapy did improve overall survival for patients with HER2+ ILC. Emphasis should be placed on improving rates of chemotherapy delivery to these patients.

| HER2+ | ILC | | IDC | | |
|---|---|---|---|---|---|
| | n | % | n | % | p-value |
| Estrogen Receptor Status | | | | | <.0001 |
| Negative | 399 | 8 | 43,672 | 32 | |
| Positive | 4395 | 92 | 91,022 | 67 | |
| Unknown | 4 | 0 | 210 | 0 | |
| Progesterone Receptor Status | | | | | <.0001 |
| Negative | 1,196 | 25 | 63,360 | 47 | |
| Positive | 3,600 | 75 | 71,283 | 53 | |
| Unknown | 2 | 0 | 261 | 0.2 | |
| Grade | | | | | <.0001 |
| 1 and 2 | 3431 | 72 | 51,622 | 38 | |
| 3 | 907 | 19 | 75,148 | 56 | |
| Unknown | 460 | 10 | 8,134 | 6 | |
| Tumor Size | | | | | <.0001 |
| < 2 cm | 1,981 | 41 | 56,563 | 42 | |
| 2 - 5 cm | 2,010 | 42 | 62,758 | 47 | |
| > 5 cm | 721 | 15 | 11,378 | 8 | |
| Unknown | 86 | 2 | 4,205 | 3 | |
| Node Status | | | | | <.0001 |
| Negative | 2,874 | 60 | 79,953 | 59 | |
| Positive | 1,582 | 33 | 46,540 | 35 | |
| Not Identified | 342 | 7 | 8,411 | 6 | |

# ANALYSIS OF PEDIATRIC DOG BITE INJURIES AT A LEVEL 1 TRAUMA CENTER OVER 10 YEARS

Katherine D. Reuter Muñoz, Lauren E. Powell, Emily S. Anderson, Anthony D. Nye, Jeremy M. Powers, Jennifer Rhodes, Andrea L. Pozez, University of Minnesota

**Background:** Dog bite injuries cause significant preventable patient morbidity and health care expenditure in children.

**Objective:** This study aimed to characterize the patient and healthcare burden related to pediatric dog bite injuries at a level 1 trauma center.

**Methods:** This is a retrospective review of 356 pediatric patients who presented to Virginia Commonwealth University Pediatric Emergency Department between July 2007 and August 2017 after sustaining dog bite injuries. Demographic information, injury details, management, outcomes, and financial information were analyzed.

**Results:** Most pediatric dog bite injuries afflicted male children (55.6%), ages 6 to 12 years (45.7%), by a household dog (36.2%). The most common offending breed was a pit bull or pit bull mix (53.0%). Infants and grade schoolers were more likely to sustain bites to the head/face (P = 0.001). Usual management consisted of primary repair (75.9%), whereas approximately 25% of the patients required advanced reconstructive techniques. Most patients healed uneventfully, but prolonged antibiotics, additional wound care, or procedures were necessary in 8.4% of the patients. Hospital charges per patient averaged US $8830.70 and tended to be higher in the younger age groups. Insurance status was statistically associated with use of conscious sedation, surgical consult placement, and surgical repair.

**Conclusion:** Although most pediatric dog bite injuries in this study healed uneventfully from primary management in the emergency department, 25% required additional interventions. Furthermore, patient care for these injuries was associated with significant but potentially avoidable personal and financial burden to families. Our data reflect a need for safety education on animal care, behavior, and interaction.

**LONG TERM OUTCOMES OF LIVER TRANSPLANTATION FOR METABOLIC DEFECTS IN CHILDREN**

Jillian K Wothe, Heli Bhatt, David Vock, Varvara Kirchner, Srinath Chinnakotla, University of Minnesota

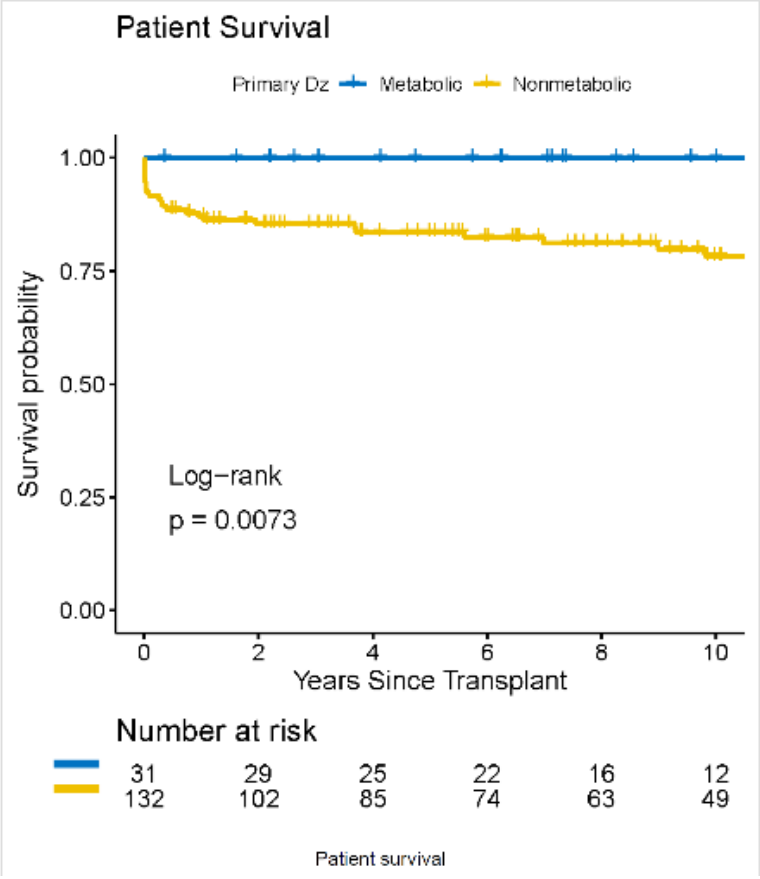
**Background:** Liver transplantation (LT) was initially developed as a therapy for liver diseases known to be associated with a high risk of near-term mortality. As overall outcomes for the procedure have improved, LT has evolved into an attractive approach for a growing number of metabolic defects in a variety of clinical situations. Few studies have evaluated the long term outcomes of liver transplantation in this subset.

**Objective:** To evaluate the long term outcomes of liver transplantation for treatment of metabolic disease.

**Methods:** Retrospective review of all pediatric transplants done for metabolic liver disease at our center over the recent 20 year cohort.

**Results:** Thirty one patients received LT for metabolic defects. Median age was 4.4 years, 24 patients received whole livers and 7 patients partial livers. Indications are shown in table 1. The patient and graft survival were compared to 131 transplants performed during the same era for other liver diseases (Figure 1). The patient survival for the patients with metabolic defects was 100% at 10 years.

**Conclusion:** Our findings confirm that metabolic liver disease is a highly successful indication for liver transplantation with exceptional long term survival.



**PATIENT EDUCATION ON CHEST PAIN AND ANGINA: AN EVALUATION OF YOUTUBE VIDEOS**

Austin Hingtgen, BA, Mahnia Shahrokhi, Shreya Avilala, Rosemary Kelly, MD, University of Minnesota

**Background:** Chest pain is an alarming symptom for most people. It is one of the most common presenting symptoms in the emergency department and it can be an indicator of acute myocardial infarction. Several studies indicate the widespread use of YouTube, by patients, as a resource for education on medical and surgical topics. Studies have also evaluated the quality and reliability of YouTube videos for self-education on topics. However, none have evaluated YouTube videos related to chest pain or angina.

**Objective:** Patients may be using YouTube as a resource to self-educate on the topic of chest pain or angina. The purpose of this study was to evaluate the reliability, quality, and understandability of YouTube videos related to chest pain and angina for patient education.

**Methods:** YouTube searches for "chest pain" (CP) and "angina" were conducted and the initial 50 videos in each search were analyzed. Videos were excluded if they were shorter than one minute, longer than 30 minutes, or in a language other than English. Characteristics were collected for each included video and videos were categorized by source and intended viewers. The reliability, quality, and understandability of each video were measured using the JAMA benchmark criteria, SPEQs and DISCERN criteria, and PEMAT-A/V criteria, respectively. Data were analyzed using statistical software.

**Results:** Analysis was completed on 52 videos (26 CP; 26 angina) following exclusion. The largest number of chest pain videos were from physician sources (58%) and were intended for patient education (65%). Videos related to angina were predominately presented by physician sources (31%) and healthcare websites (31%) and were equally intended for medical professional education (50%) and patient education (50%). The average video length in both the CP and angina groups was between 5 and 6 minutes. An indication that symptomatic individuals should notify emergency services was evident in 50% of CP videos and 38% of angina videos. For the JAMA benchmark, SPEQS, DISCERN, and PEMAT-A/V criteria, the average scores for CP videos were 3.5, 6, 36, and 11.2. The average scores for angina videos were 2.5, 8, 43.5, and 11.5, respectively. A low proportion of videos mentioned surgical treatment options in both the CP (19%) and angina (31%) groups.

**Conclusion:** Identifying patient education videos may be difficult for patients searching on YouTube. However, patient education videos relating to both chest pain and angina demonstrated average to above-average reliability. The quality of YouTube videos related to both chest pain and angina was below average based on two sets of quality criteria scores. Understandability in both the chest pain and angina videos was average and indicated the need for more lay-person-directed patient education videos. Additionally, patients would benefit from a more explicit indication to notify emergency services immediately if they are having symptoms of acute coronary syndrome. This study suggests that current YouTube videos discussing chest pain and angina lack the quality and understandability necessary to properly educate patients.

# READABILITY ANALYSIS OF PEDIATRIC CLEFT LIP AND PALATE SPANISH AND ENGLISH LANGUAGE PATIENT EDUCATION MATERIALS

Lauren E. Powell, Jade Cohen, Erica M. Bien, Ruth J. Barta, University of Minnesota

**Background:** Health literacy is the ability to acquire, comprehend, and utilize medical information in healthcare related decisions. Poor health literacy may result in increased healthcare expenditures and poor surgical outcomes.1 The National Institutes of Health recommend patient education materials be written at a 6-7th grade reading level.1

**Objective:** The purpose of this study is to identify and compare the reading grade level of cleft lip and palate patient education materials written in both English and Spanish.

**Methods:** English and Spanish language online patient education materials on cleft lip/palate were collected from all American Cleft Palate-Craniofacial Association (ACPA) approved sites, 189 in total. English materials were analyzed using 3 different validated readability tools: Flesch-Kincaid, SMOG, and Coleman-Liau. Spanish materials were analyzed using the Fry Graph, Fernandez-Huerta, and INFLESZ scores. Readability between the English and Spanish materials were compared using an unpaired t-test. The p-value for statistical significance was set at 0.05.

**Results:** A total of 170 (89.9%) of programs provided English language materials online, with an average reading grade level of: 10.8 for Flesch-Kincaid (10-11th grade), 9.8 for SMOG (9-10th grade), and 10.9 for Coleman-Liau (10-11th grade). A total of 44 (23.3%) sites provided Spanish language materials online, calculated at 6.1 for Fry Graph (6th grade reading level), 65.4 for Fernandez-Huerta (9th grade reading level), and 60.8 for INFLESZ (8-9th grade reading level). Spanish materials were written at a lower reading grade level in comparison to those in English (t=6.1, p

**Conclusion:** Online English language materials on cleft lip and palate reconstruction were much more accessible than Spanish language materials by ACPA craniofacial centers. Both sets of patient education materials were above the recommended 6-7th reading grade level and represent a need for improvement. Interestingly, the Spanish language materials were written at a lower reading grade level in comparison to English materials. Aiming to refine readability is associated with lowered healthcare costs, improved morbidity and mortality, as well as improved patient satisfaction.1