
# 2022 CAS Annual Meeting

## Resident's Competition

(Abstracts and Case Report/Series)

# Contents

# A Retrospective Cohort Study Comparing Catheter Replacement Rates with Programmed Intermittent Epidural Bolus and Continuous Epidural Infusion

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**Introduction:**
Epidural catheter failure leading to replacement is a common problem, estimated to occur in 2.1-7.7% of epidurals[(1,2)]. The relationship between epidural catheter replacement rate and labor analgesia maintenance regimen is not well defined. Our objective was to investigate whether maintenance of labor analgesia with programmed intermittent epidural boluses (PIEB) is associated with fewer epidural catheter replacements than continuous epidural infusions (CEI).

**Methods:**
A historical cohort study was conducted of patients who received epidural labor analgesia initiated with either the common epidural (EPI) or combined spinal epidural (CSE) technique and maintained with PIEB or CEI between January 1, 2012 and December 31, 2019. Descriptive statistics were used for demographic data. Chi squared analyses were utilized to assess differences in our primary outcome (epidural catheter replacement) and secondary outcomes: time until catheter replacement, incidence of epidural top-ups, and time until epidural top-up.

**Results:**
There were 11,277 EPIs and 4082 CSEs included. 13,177 were maintained with PIEB and 2182 with CEI. Incidence of catheter replacement was 2.9% and did not differ by maintenance regimen (PIEB vs CEI, $\chi^2$ = 0.846, $P$ = 0.35). EPIs were more likely to be associated with catheter replacement than CSEs (3.0% vs 2.4%, $\chi^2$ = 4.651, $P$ = 0.031). Incidence of epidural top-ups was lower with PIEB than CEI (13.8% vs 17.0%, $P$ < 0.001), and time until first top-up was longer for PIEB (M = 315.9, SD = 274.3) than CEI (M = 270.2, SD = 219.9), $P$ = 0.003. Time until epidural replacement was not statistically different between groups, and there was no difference in incidence or time until top-up between the CSE and EPI groups. Patient characteristics and delivery characteristics can be found in Table 1.

**Discussion:**
Our incidence of catheter replacement of 2.9% is consistent with previously reported rates. We found no association between type of labor epidural maintenance regimen and incidence of epidural catheter replacement. The CSE technique was associated with a lower rate of catheter replacement than the common epidural technique. PIEB was associated with fewer epidural top-ups and may confer better parturient analgesia than CEI. Further research should target how other risk factors for epidural catheter failure may act as covariates.

**References:**


1. Int J Obstet Anesth. 2016 May;26:4-7.
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Table 1. Patient and Delivery Characteristics

| | **EPID (n = 11,277)** | **CSE (n = 4082)** | ***P value*** | **PIEB (n = 13,177)** | **CEI (n = 2182)** | ***P value*** |
|---|---|---|---|---|---|---|
| Patient Characteristics | | | | | | |
| Age (mean [SD]) | 29.73 [5.2] | 29.74 [5.2] | *0.945* | 29.7 [5.2] | 29.5 [5.2] | *0.058* |
| BMI at Delivery (mean [SD]) | 31.4 [6.4] | 31.6 [6.3] | *0.139* | 31.5 [6.4] | 31.3 [6.1] | *0.301* |
| Gestational Age at Delivery (weeks) (mean [SD]) | 39.2 [1.8] | 39.2 [1.8] | *0.814* | 39.2 [1.8] | 39.2 [1.7] | *0.604* |
| Multiparous n (%) | 4926 (43.9%) | 1834 (45.2%) | *0.167* | 5819 (44.4%) | 941 (43.4%) | *0.383* |
| Multiple Gestation n (%) | 184 (1.6%) | 78 (1.9%) | *0.238* | 218 (1.7%) | 44 (2.0%) | *0.224* |
| Presence of Scoliosis n (%) | 113 (1.0%) | 40 (1.0%) | *0.903* | 127 (1.0%) | 26 (1.2%) | *0.319* |
| Use of analgesics (%) | 974 (8.7%) | 355 (8.7%) | *0.906* | 1148 (8.8%) | 181 (8.3%) | *0.528* |
| Use of Nitrous Oxide (%) | 1469 (13.1%) | 529 (13.0%) | *0.915* | 1736 (13.2%) | 262 (12.1%) | *0.137* |
| Type of Labour, n (%) | | | | | | |
| • Spontaneous (%) | 3306 (29.5%) | 1242 (30.6%) | *0.196* | 3856 (29.5%) | 692 (31.9%) | *0.022** |
| • Induced (%) | 7895 (70.5%) | 2817 (69.4%) | *0.196* | 9234 (70.5%) | 1478 (68.1%) | *0.022** |
| Method of Delivery, n (%) | | | | | | |
| • Spontaneous Vaginal (%) | 7891 (70.3%) | 2842 (70%) | *0.680* | 9155 (69.8%) | 1578 (72.7%) | *0.006** |
| • Instrumental (forceps or vacuum) (%) | 1451 (12.9%) | 562 (13.8%) | *0.143* | 1777 (13.5%) | 236 (10.9%) | *<0.001** |
| • Cesarean delivery (%) | 1861 (16.6%) | 652 (16.1%) | *0.434* | 2163 (16.5%) | 350 (16.1%) | *0.672* |

Abbreviations: BMI, Body Mass Index

# Bedside Rectus Femoris Ultrasound for Screening of Sarcopenia in Surgical Patients

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**Introduction:**
Sarcopenia is a progressive and generalized skeletal muscle disorder1 and is associated with poor perioperative outcomes2. The European Working Group on Sarcopenia in Older People (EWGSOP) has published a revised definition of sarcopenia in 2018 (EWGSOP2) which includes low muscle strength, low muscle mass and low physical performance2. Diagnosing sarcopenia may be time consuming, costly and require considerable expertise using the gold standard modalities dual-energy x-ray absorptiometry (DEXA) and bioelectrical impedance analysis (BIA)2. There is some emerging evidence suggesting the use of ultrasound measurements of the rectus femoris (RF) to diagnose sarcopenia3-4. We hypothesized that the bedside ultrasound of the rectus femoris may facilitate identifying sarcopenic patients perioperatively and therefore may serve as a useful screening tool.

**Methods:**
Local ethics board approval was obtained. Patients scheduled for major non cardiac surgery underwent a prospective diagnostic ultrasound study in which measurements of RF thickness, RF cross-sectional area (CSA) and echogenicity with grayscale histogram were collected. Image acquisition was performed in the supine position, with knees fully extended and quadriceps relaxed at the midpoint between the anterior superior iliac spine (ASIS) and the upper border the patella. Indexed skeletal mass (ASMI) and total body fat were assessed with BIA and hand grip test was performed to identify sarcopenia as per standard of care. The primary outcome was to evaluate the accuracy of the ultrasound in diagnosing sarcopenia, via measurement of the RF thickness, RF CSA and RF CSA normalized for body fat. A cutoff point was identified using empirical receiver operating characteristic (ROC) curve when compared to diagnosis for sarcopenia using the EWGSOP2 criteria.

**Results:**
A total of 33 patients were included. Sarcopenia was identified in 5 of the 33 patients using the standard of care diagnostic strategies (15%). Receiver operating characteristic curve analysis showed that RF thickness and RF CSA were are able to identify sarcopenia (area under the curve-receiver operating characteristic [AUC-ROC]; 0,84 [95% CI, 0,63 to 1,00] and 0,87 [95% CI, 0,66 to 1,00], respectively), whereas the cross-sectional area of the rectus femoris normalized by % of body fat is more promising (area under the curve-receiver operating characteristic; 0,90 [95% CI, 0,73 to 1,00]). A moderate significant correlation was demonstrated between rectus femoris CSA and grip strength (0,45 [p: 0,0065]) as well as between rectus femoris echogenicity and BMI (0,48 [p: 0,0046]).

**Discussion:**
Rectus femoris ultrasound measurement shows promise in screening for sarcopenia in a surgical population awaiting major non cardiac surgery.

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Table 1:

**Table 3.** Performance Parameters of Rectus Femoris Cutoff Point for Diagnosis of Sarcopenia

| | RF thickness (cm) | RF CSA ($cm^2$) | RF CSA/% body fat ($cm^2$/%) |
|---|---|---|---|
| Cutoff point for sarcopenia | <0,85 | < 4,50 | < 0,109 |
| Sensitivity, % (95%CI) | 100 (87,66-100) | 89.29 (71,77-97,73) | 92,86 (76,50-99,12) |
| Specificity, % , (95%CI) | 60 (14,66-94,73) | 80 (28,36-99,49) | 80 (28,36-99,49) |
| AUC of ROC curve, (95%CI) [SE] | 0,84 (0,63 – 1) [0,11] | 0.87 (0,66 – 1) [0,11] | 0,90 (0,73 – 1) [0,09] |
| LR+ (95%CI) | 2,5 (0,85-7,31) | 4,46 (0,77-25,89) | 4,64 (0,80-26,88) |
| LR- (95%CI) | NA | 0,13 (0,04-0,43) | 0,9 (0,02-0,36) |
| PPV (95%CI) | 93,33 (82,71-97,62) | 96,15 (81,17-99,32) | 96,30 ( 81,79-99,34) |
| NPV (95%CI) | 100% | 57,12 (29,57-80,90) | 66,67 (32,91-89,08) |

*AUC : Area Under Curve, CI : confidence interval, cm : centimeters, CSA : cross-sectional area, kg : kilogram, LR - : negative likelihood ratio, LR + : positive likelihood ratio, NPV : negative predictive value, PPV : positive predictive value, RF : rectus femoris, SD : Standard deviation, ROC : receiver operating characteristic*

# Optimizing the Portable Emergency Anesthesia Tote for Anesthesiologists Responding to Medical Emergencies

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**Introduction:**

Emergency airway management outside of the operating room (OR) is associated with high risk of morbidity and mortality. Outside of the OR, poor outcomes are twice as likely to occur and all claims made from events outside of the OR resulted in permanent neurological injury or death in the American Society of Anesthesiologists closed claims database (1, 2). Also, rates of difficult intubations are almost twice as high outside of the OR (10.3% vs 5.8%) (3, 4).

At our institution, emergency airway management outside of the OR, emergency department or ICU is managed by the code team, which includes an anesthesiology resident. The anesthesiology resident is responsible for bringing additional airway equipment in the portable emergency anesthesia tote (PEAT) which includes medications and airway equipment. Our aim was to increase the use of the portable emergency anesthesia tote by 30% three months after we implemented changes to increase its usability.

**Methods:**

We collected baseline measurements by surveying current residents and recent graduates from our anesthesiology residency program about the self-reported use of the PEAT at code blues and to identify barriers to use and deficits of usability. We created a 20-question survey asking about education and orientation to the PEAT, location of the PEAT, percentage of time the residents brought the PEAT, barriers to use, suggestions for improvement and use of the Difficult Airway Management (DAM) cart. The survey period was November 4-10, 2020. The overall response rate for the survey was 81.5% (22/27). We created a list of recommendations and action plan by group consensus of the team using the data from the survey. This process was intended to be iterative in a Plan-Do-Study-Act (PDSA) cycle. In total eight interventions were generated in response to the survey results. We identified four categories of interventions: improvement of orientation and knowledge of the PEAT, improvement of orientation and knowledge of the DAM cart, optimization of the size, weight and format (from tote to bag) of the PEAT, and optimization of the contents of the PEAT. We measured the outcomes by re-distributing the survey three months after completing the first PDSA cycle.

**Results:**

The overall response rate for the follow up survey was 74% (n=20/27). The survey period was June 8-12, 2021. Twelve of the twenty respondents met exclusion criteria by not having used the portable emergency anesthesia bag after its optimization. The primary outcome was how frequently residents brought the portable emergency anesthesia bag (PEAB) to code blues. Prior to the interventions, residents brought the portable emergency anesthesia tote to code blues 12% of the time (median 5%). After the optimization, residents brought the portable emergency anesthesia bag to code blues 42.5% of the time (median 20%). Secondary outcomes included knowledge about the locations of the portable emergency anesthesia tote. Prior to optimization, 23.5% (n=4/17) of the residents did not know the location of a single portable emergency

anesthesia tote. After our optimization with improved signage 100% (n=8/8) knew where 2 of the 3 portable emergency anesthesia bags were located.

**Discussion:**

This QI project identified low use of the PEAT which could be categorized into seven barriers of use and deficits of usability. We successfully implemented changes to improve location visibility, the size and weight of the PEAB, streamlined the contents to the most desired and useful equipment and added modern airway management equipment including a video laryngoscope. We met our goal of increasing the percentage of time the portable emergency anesthesia bag was brought to code blues by 30% (12% to 42%) and anticipate this change will decrease the rate of airway complications in our hospital.

**References:**


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# STRIVE – Resilience Curriculum for Novice Physicians-in-Training

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**Introduction:**

Physician wellness has gained attention over recent years due to growing concerns regarding mental illness and burnout [1]. In addition to detrimental effects on physician well-being, burnout is associated with an increased risk of patient safety incidents [2]. Road to Mental Readiness (R2MR) military curriculum was developed to 'build awareness of mental illness and operational stress injuries through education with a goal to improving short-term performance and long-term health outcomes' [3]. Simulation Training for Resilience in Various Environments (STRIVE), an adaptation of R2MR, provides formal resiliency training to augment medical professional preparedness and positive adaptation in challenging clinical environments. Physicians-in-training have been identified as an at-risk population for burnout [4]. We propose that formal STRIVE training may improve self-reported resilience in physicians-in-training. This pilot study assesses STRIVE course delivery to junior residents by evaluating recruitment rates, course attendance and compliance with follow-up surveys.

**Methods:**

Institutional research ethics board approval (REB 118769) was obtained. This is a single-centre randomized controlled trial with a 1:1 allocation ratio between the intervention (STRIVE) and control groups. Participants for this pilot study were a convenience sample of first- and second-year residents from our institution's anesthesia and emergency medicine residency programs. Consented participants were randomized using REDCAP sequence generation. Participants randomized to STRIVE received a 4-hour interactive workshop on personal mental wellness strategies followed by high-fidelity simulations to reinforce and apply learned techniques. Participants randomized to the control group received information regarding available resilience resources for self-study, as per usual departmental process. Study design and intervention details were concealed from control group participants to minimize subject bias. Self-reported resilience was quantified using the validated Connor-Davidson Resilience Scale (CD RISC-10). Scores range from 0-40 with higher scores indicating greater perceived resilience [5]. Anonymous surveys were electronically distributed to all participants prior to the course delivery (baseline) and at 3-months post-intervention. Resilience scores at 3-months were compared between groups using an ANCOVA model with baseline scores from respective groups used as a co-variate. Data are presented as mean (interquartile range [IQR]). A value of $p<0.05$ was considered statistically significant.

**Results:**

A total of 20 residents were consented from 24 potential participants, fulfilling the pilot study primary outcome metric (recruitment of >= 80% of eligible participants). The STRIVE course was completed by all participants randomized to the intervention group (n=10). Follow-up surveys were completed by 90% of the STRIVE group and 80% of the control group. Baseline resilience scores between groups were very similar (STRIVE: 28.1 [26.5-30]; control: 28.9 [26.5 – 33], Reported resilience scores 3-months post-intervention increased in the STRIVE group (31.1 [27-33.5]) and decreased in the control group (27.4 [22.8-33]). After adjustment for baseline resilience scores, there was a statistically insignificant difference in 3-month resilience

scores between the groups (p=0.093). In the post-intervention survey, all STRIVE participants reported that skills learned during the STRIVE course had positively contributed to coping strategies employed during stressful clinical situations.

**Discussion:**

This study demonstrates feasibility of STRIVE course delivery and evaluation in junior anesthesia and emergency medicine residents. Participant recruitment, course and survey completion fulfilled pre-established feasibility metrics indicating a high level of engagement in formal resident resilience training. Preliminary results evaluating the effect of formal training on self-reported resilience suggest a potential positive effect of STRIVE course delivery. An appropriately powered, full-scale randomized controlled trial with participation of other postgraduate specialty programs is planned.

**References:**


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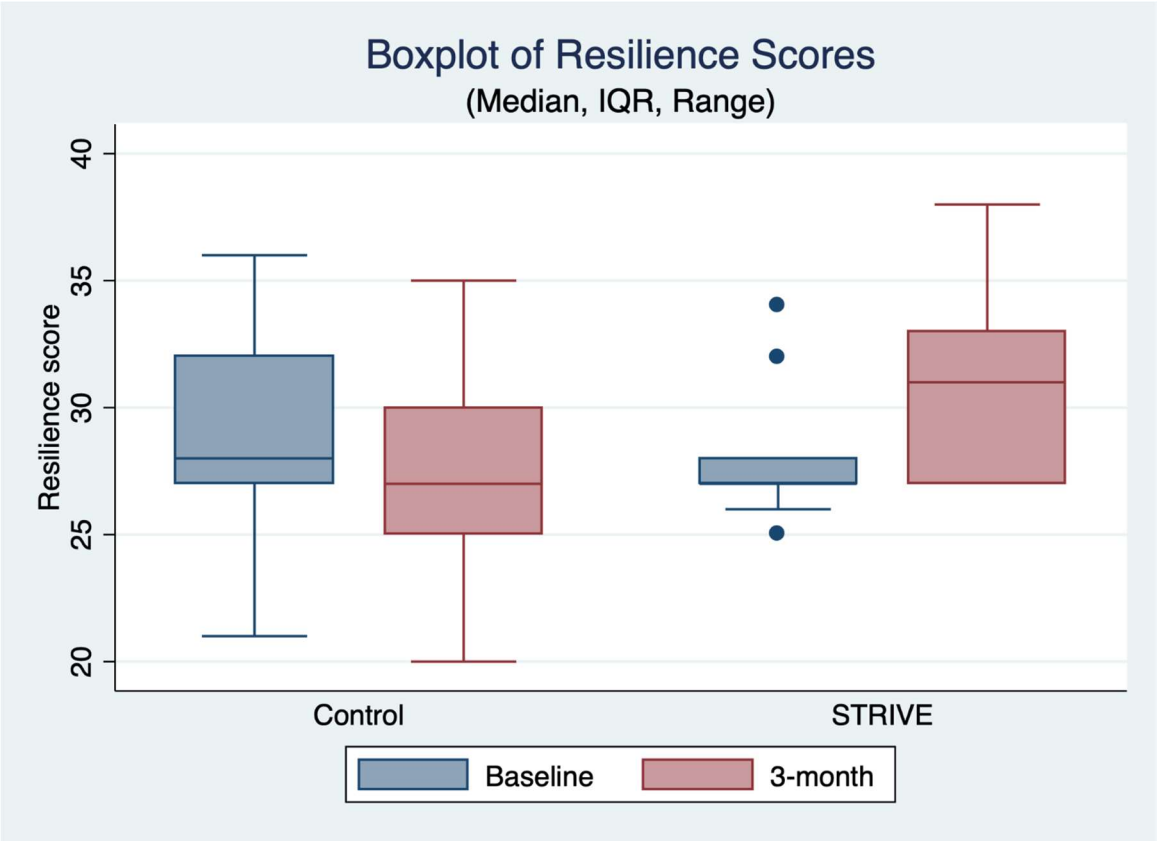
Figure 1:


Boxplot of Resilience Scores
(Median, IQR, Range)
Resilience score
20
25
30
35
40
Control
STRIVE
Baseline
3-month