

Introduction

- Dedicated orthopedic trauma rooms (DOTRs) are daytime operating rooms with fellowship-trained traumatologists for urgent orthopedic trauma treatment.
- Prior to DOTRs, urgent orthopedic trauma cases were usually managed by: (1) emergent care, "bumping" elective cases, (2) "after-hours" care following elective cases or (3) "add-on" care the next day¹.
- DOTRs have been associated with less scheduling conflicts, decreased "after-hours" procedures, improved morbidity and mortality outcomes, shorter hospital and intensive care unit length of stay, improved surgeon lifestyle, and decreased costs.^{1,2,3}
- These benefits are largely owed to operating during daytime hours with dedicated resources and personnel to support a predictably scheduled DOTR.¹
- Prior to DOTR implementation at our institution on January 20, 2013, orthopedic surgeons shared responsibility of urgent orthopedic trauma, after which, traumatologists accepted responsibility for these cases.
- It was previously unknown what effect a DOTR would have on elective arthroplasty surgeon volume, especially for early-career surgeons who utilize add-on trauma cases to complement elective operating days.
- This study was conducted at a Level I trauma center to determine the effects of a DOTR on elective arthroplasty volume.
- We hypothesized that changes in workflow associated with a DOTR, including decreased surgeon fatigue, decreased elective case disruption, and enhanced professional life development may highlight an underappreciated benefit of a DOTR to elective arthroplasty surgeons in the form of increased arthroplasty case volume.

Materials & Methods

- A retrospective analysis was performed for two three-year intervals before and after introduction of a DOTR on January 20, 2013, at a Level I trauma center.
- Arthroplasty cases were classified as either pre-DOTR or post-DOTR depending on emergency department arrival date before or after January 20, 2013.
- Surgeons were included if they performed elective primary total hip arthroplasty (THA), total knee arthroplasty (TKA), or total shoulder arthroplasty (TSA) regularly from 2010-2015 and accepted call responsibility prior to DOTR introduction.
- Revision arthroplasty cases, arthroplasty cases to address infection, and surgeons that did not participate in the trauma call schedule, did not perform arthroplasty cases regularly at the institution or retired during the study period were excluded.
- The Michigan Health & Hospital Association Database was consulted using ICD-9 procedure codes to calculate the proportion of arthroplasty cases in Michigan that surgeons performed in order to correct for the natural observed increase in arthroplasty on an annual basis during the study period.
- Regression analysis was conducted with DOTR as a predictive variable using de-identified patient and surgeon data.
- An ANOVA mixed model with random intercepts compared proportional estimated mean case volume pre-DOTR and post-DOTR.
- Results were reported as both mean annual case volume and mean annual case volume proportion in Michigan for individual surgeons, five surgeons collectively, and the institution.

Results

Table 1. Mean Case Volume and Mean Case Volume Proportion Pre-DOTR and Post-DOTR Implementation

	Mean Cases Pre-DOTR	Mean Cases Post-DOTR	Mean Proportion Cases Pre-DOTR	Mean Proportion Cases Post-DOTR
Surgeon A	172.3	303.0	46.40	72.14
Surgeon B	38.00	47.33	10.26	11.27
Surgeon C	56.67	66.67	15.28	15.88
Surgeon D	11.33	19.67	3.049	4.698
Surgeon E	25.00	39.67	85.94	106.3
Surgeons A-E	303.3	476.3	75.80	104.2
Institution THA/TKA	567.7	739.3	155.4	176.0

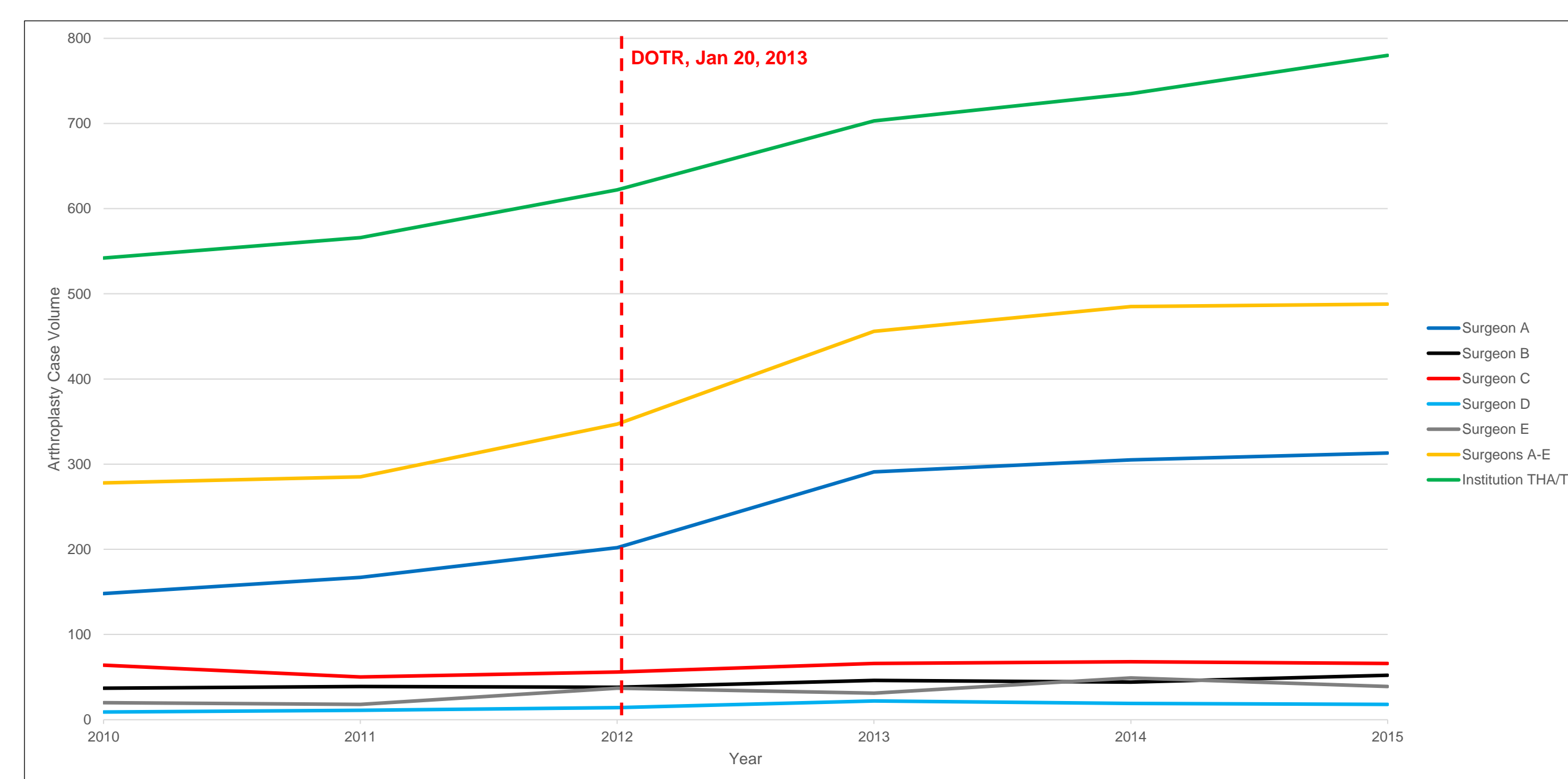


Figure 1. Individual Surgeon, Collective Surgeons, and Institutional Case Volume Pre-DOTR and Post-DOTR Implementation

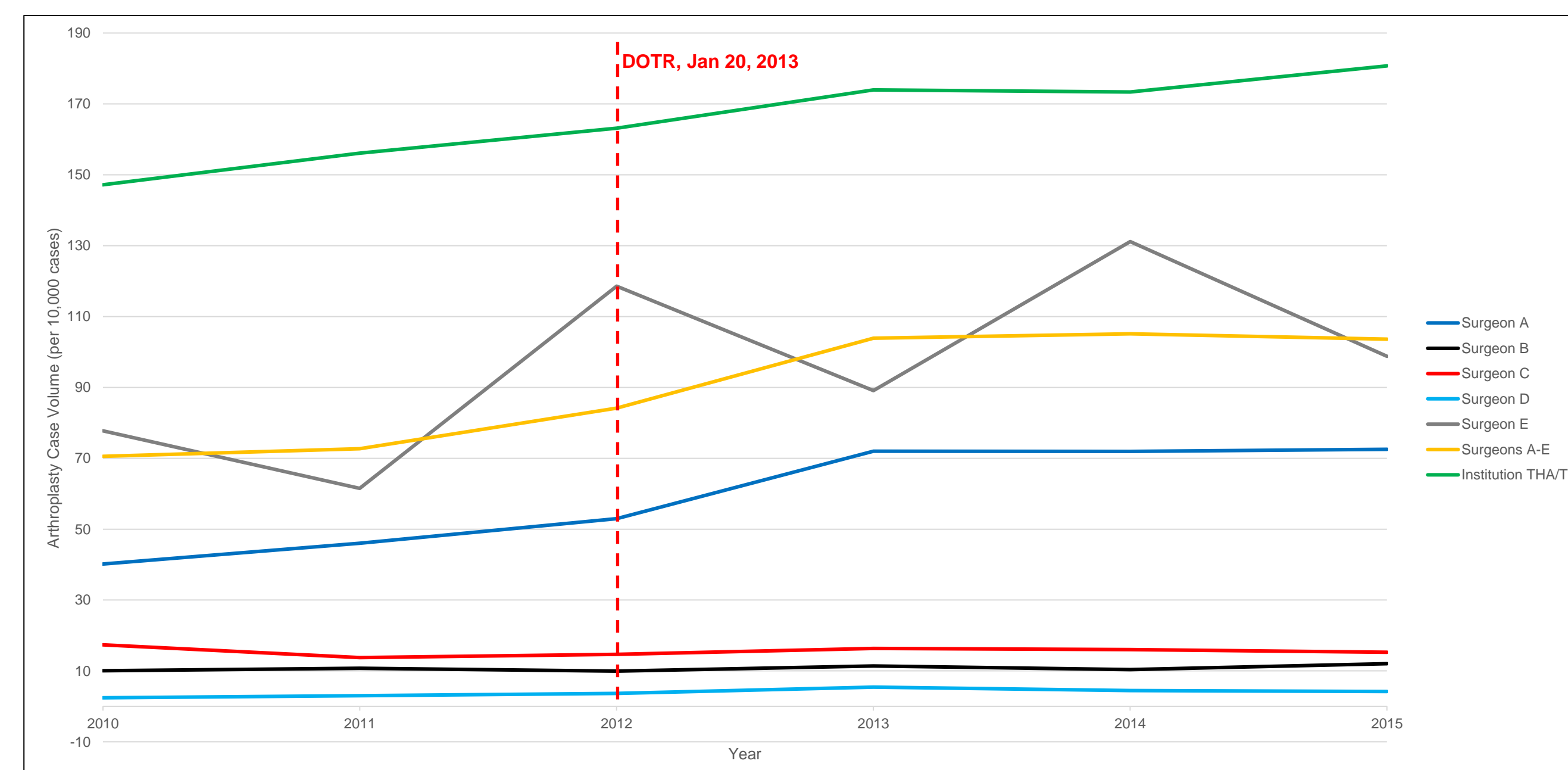


Figure 2. Individual Surgeon, Collective Surgeons, and Institutional Case Volume Proportion Pre-DOTR and post-DOTR implementation

Results

- Our institution performed 1730 TKA/THA cases in the pre-DOTR period, averaging 576.7 cases/year, and 2218 cases in the post-DOTR period, averaging 739.3 cases/year (Table 1) (Figure 1).
- Our institution averaged 162.7 more TKA/THA cases/year and increased its annual average statewide proportion of cases by 20.53 per 10,000 cases in the post-DOTR period (Table 1) (Figure 2).
- Surgeons A-E performed 910 cases in the pre-DOTR period, averaging 303.3 cases/year, and 1429 cases in the post-DOTR period, averaging 476.3 cases/year.
- Surgeons A-E averaged 173.0 more cases/year and increased their annual average statewide proportion of elective arthroplasty cases by 28.39 per 10,000 cases in the post-DOTR period.
- An ANOVA mixed model revealed a statistically significant increase in proportional arthroplasty case volume for Surgeons A-E between the pre-DOTR and post-DOTR periods, with an estimated mean difference of 9.879 cases per 10,000 cases ($p=0.039$) (CI [0.5442, 19.21], SE=4.523).

Discussion

- Our results coincide with introduction of a traumatologist to a private practice group which increased office visits, referrals, and uninterrupted clinic time while providing guaranteed operative time and decreasing surgeon fatigue from less call burden.⁴
- Higher elective arthroplasty volume benefits patients and hospital systems, as systematic reviews have established that higher surgeon case volume is associated with better postoperative outcomes in arthroplasty.^{5,6}
- Arthroplasties are some of the highest profit margin cases in medicine, with contribution margins of \$10,630 for TKA and \$11,335 for THA, translating to an approximate total increase in hospital profit margin of \$1,392,530 for Surgeon A alone between the pre-DOTR and post-DOTR periods.⁷
- Our study was limited by a small sample size, inclusion of three orthopedic procedures and one orthopedic shoulder surgeon.

Conclusions and Future Directions

- Our institution, a Level 1 trauma center, introduced a DOTR on January 20, 2013, which was associated with increases in the total number, annual mean, and annual proportion of elective arthroplasty case volume on an institutional and individual level.
- The outcome of increased elective arthroplasty case volume following DOTR implementation introduces an original benefit to elective arthroplasty surgeons.
- A larger, multi-institutional study may be considered in the future.

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Scleroderma after COVID-19 Infection and Vaccination

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INTRODUCTION

Scleroderma is a rare, heterogeneous group of autoimmune connective tissue disorders characterized by fibrotic hardening and tightening of the skin.¹ Though the pathogenesis is not fully understood, scleroderma has developed as a drug-induced and paraneoplastic phenomenon.¹ However, there has been little discussion on scleroderma onset following COVID-19 infection and vaccination. We present an updated review of scleroderma after COVID-19 infection and vaccination and its implications for adverse event monitoring.

METHODS

Literature searches were conducted on MEDLINE (PubMed), Embase, Scopus, and Google Scholar from 2019 to January 2023. Thirteen articles were selected based on subject relevance, and references within articles were also screened. Cases that were flares or did not reach a definitive diagnosis for scleroderma were excluded. All scleroderma cases were diagnosed via clinical, biopsy, or antinuclear antibody (ANA) findings.

RESULTS

As of January 2023, there have been four cases of scleroderma after COVID-19 infection ($M_{age} = 54.50$ years, $R_{age} = 47-61$ years, Male:Female = 1:3) and ten cases of scleroderma after COVID-19 vaccination ($M_{age} = 62.8$ years, $R_{age} = 45-73$ years, Male:Female = 1:9) (Table 1). Moderna's Spikevax accounted for two cases, Pfizer-BioNTech's Tozinameran accounted for seven cases, and Oxford-AstraZeneca's Vaxzevria accounted for one case.

RESULTS (CONT.)

Table 1: Scleroderma after COVID-19 Infection and Vaccination

Patient age and sex	Infection or Vaccination	Type of Scleroderma	COVID-19 vaccine type	Latency (days)	Distribution	Clinical Presentation	ANA Status	Treatment	Outcome
45 - y/o F ¹ (Antoñanzas et al)	Vaccination	Localized	Spikevax, first dose	14 days	Back	Patchy oval indurated lesions	Not Reported	Betamethasone and topical calcipotriol	Resolution and no recurrences after 6 months
52 - y/o F ¹ (Antoñanzas et al)	Vaccination	Localized	Tozinameran, second dose	42 days	Abdomen and thighs	Indurated brownish patches	Negative	Oral methotrexate 15 mg/m ² /week	Lesions regressed
60 - y/o F ¹ (Sproew et al)	Vaccination	Not Reported	Spikevax, first dose	42 days	Face, chest, lower portion of legs, back, abdomen, and forearms	Hidebound skin with shiny surfaces	Not Reported	Prednisone and mycophenolate mofetil	Crete kinase levels lower to normal, progression of skin thickening
72 - y/o F ¹ (Sproew et al)	Vaccination	Localized	Tozinameran, second dose	28 days	Arms and legs	Skin thickening and puckering of skin	Not Reported	Mycophenolate mofetil and prednisone	Eosinophil counts lowered to normal, skin softened
55 - y/o F ¹ (Metin et al)	Vaccination	Localized	Tozinameran, second dose	28 days	Left breast	Ill-defined indurated plaque with an active erythematous border and central violaceous color with solitary bullae	Not Reported	Topical clobetasol propionate pomade and calcipotriol pomade	Resolution after 1 month
47 - y/o F ¹ (Oh et al)	Vaccination	Localized	Tozinameran, second dose	21 days	Thighs, calves, and inner arms	Erythematous, indurated, hyperpigmented plaques	Positive (>1:640)	Calcipotriol ointment and mometasone cream	Reduced erythema and softening of skin after 6 months
61 - y/o F ¹ (Paolino et al)	Vaccination	Localized	Tozinameran, first dose and second dose	15 days after first dose and 15 days after second dose	Abdomen, back, lower limbs	Whitish and sclerotic plaques	Positive (1:160)	Clobetasol 0.05% cream and MTX 7.5 mg/week (MTX replaced with mycophenolate)	Good resolution
52 - y/o F ¹ (Paolino et al)	Vaccination	Localized	Tozinameran, second dose	7 days	Abdomen, chest, upper limbs	Whitish and sclerotic plaques	Negative	Methotrexate 7.5 mg/week	Good resolution
64 - y/o M ¹ (Paolino et al)	Vaccination	Localized	Vaxzevria, 1st dose	20 days	Upper limbs, abdomen	Whitish and sclerotic plaques	Positive (1:160)	Tacrolimus 0.1% cream	Resolved
73 - y/o F ¹ (Paolino et al)	Vaccination	Localized	Tozinameran, second dose	20 days	Lower limbs, abdomen	Whitish and sclerotic plaques	Positive (1:320)	Tacrolimus 0.1% cream	Good resolution
47 - y/o M ¹ (Fineschi)	Infection	Not Reported	N/A	21 days	Not Reported	Cutaneous generalized rash with diffuse erythema Replaced with heliotrope rash after two weeks	Positive	Antibiotic ointment	Reduced heliotrope rash
53 - y/o F ¹⁰ (Giuggioli et al)	Infection	Not Reported	N/A	30 days	Hands and Nail Folds	Raynaud Phenomenon and scleroderma pattern	Positive	Topical capsaicin cream	In resolution
57 - y/o F ¹ (Latfi et al)	Infection	Localized	N/A	21 days	Pre-tibial regions, arms, and lower abdomen	Skin turned shiny and tight with severe sclerosis	Positive, then Negative on repeat testing	Corticosteroids and emollients	Improvement in pain and stiffness of skin. Patient had a comorbid condition of lung cancer.
61 - y/o F ¹ (Pigliacelli et al)	Infection	Localized	N/A	30 days	Forearms	Bilateral sclerotic cutaneous lesions, several brownish and violaceous plaques with mild erythematous borders	Negative	Clobetasol ointment and vitamin E emollient	Resolution after 16 weeks

DISCUSSION

Multiple hypotheses have been proposed to explain the pathogenesis of infection/vaccine-induced scleroderma. COVID-19 vaccines may induce scleroderma through molecular mimicry, triggering the production of cross-reactive antibodies and autoreactive lymphocytes that result in immune dysregulation.⁵⁻⁷ Both the mRNA (Tozinameran, Spikevax) and recombinant adenoviral vector (Vaxzevria) vaccines induce chemokines, cytokines, and type I interferon activation, which are implicated in localized and systemic sclerosis pathogenesis.⁶ The lipid nanoparticles in mRNA vaccines may trigger an autoimmune response,⁵ or the vaccine-induced dysfunction of regulatory T-cells may lead to fibrogenic alterations in the dermis that precipitate scleroderma.⁷ Finally, patients may be genetically predisposed to post-vaccination scleroderma and exposure to the vaccine antigen triggers cytokine release against additional non-specific antigens that activates the inflammatory cascade.⁸ Scleroderma after COVID-19 infection may be due to molecular mimicry involving cross-reactivity between viral epitopes and host antigens.⁹⁻¹¹ Genetic predisposition has also been raised as a potential risk factor for post-infection scleroderma.¹¹ Defective dendritic cells that compromise innate and adaptive immunity are potential contributors to post-infection scleroderma.⁹ COVID-19 infection may induce scleroderma through endothelial injury.¹⁰

DISCUSSION (CONT.)

Because the SARS-CoV-2 virus enters cells through the angiotensin-converting-enzyme 2 receptor that is widely expressed in endothelial cells, COVID-19 infection can cause diffuse endotheliitis, subsequently triggering vascular and fibroblast changes implicated in scleroderma pathogenesis.¹⁰ It should be noted that one of the patients who developed scleroderma after COVID-19 infection also had lung cancer.¹² This is a limitation that may challenge the clinical relationship between scleroderma and COVID-19 infection, as scleroderma onset may be a paraneoplastic phenomenon.^{1,12}

CONCLUSIONS

Hypotheses for the pathogenesis of scleroderma after COVID-19 infection and vaccination include molecular mimicry, cytokine activation, and endothelial injury, and we advise clinicians to monitor for this rare potential complication. However, the benefits of the COVID-19 vaccines still greatly outweigh the risks.

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ROTATOR CUFF REPAIR WITH BIOINDUCTIVE ALLOGRAFT PATCH ACHIEVES EQUIVALENT PATIENT-REPORTED OUTCOMES AT 2 YEARS POSTOPERATIVELY

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Background:

Retrospective analysis comparing postoperative outcomes in two patient populations who underwent Rotator Cuff Repair (RCR)

- **Group 1:** Standard RCR
- **Group 2:** RCR augmented with bioinductive patch

Recovery results were compared on the basis of patient-reported outcomes, range of motion (ROM), and post-operative complications

Methods:

Patients included had a ultrasound or MRI confirmed supraspinatus or infraspinatus tear from 2016-2021

Patients were excluded for the following:

- Open RCR
- Prior ipsilateral shoulder surgery
- Active infection at the time of surgery
- Less than 6-weeks of post-operative follow-up

Patch RCR was matched 2:1 to controls based on age, sex, BMI, tendon tear size, and number of tendons involved.

Patient Reported Outcome Information System (PROMIS) scores were recorded for up to 2 years where available:

- Upper Extremity (-UE)
- Pain Interference (-PI)
- Depression (-D)

Results:

81 total patients undergoing RCR with patch augmentation compared to 162 control patients (standard RCR)

No significant differences were found between groups in terms of:

- Age
- Sex
- Smoking Status
- Diabetes
- Partial vs. Full-Thickness Tears
- Tear Size

ROM in forward flexion (FF) and abduction were significantly increased at 6-months post-op for the patch-augmented group vs. the control group:

- **FF** 156.8±21.6 vs. 148.1±23.2 degrees ($p < .01$)
- **Abduction** 133.1±33.2 vs. 114.1±36.5 degrees ($p=.019$)

No significant differences were seen for PROMIS-UE, PROMIS-PI, or PROMIS-D scores.

Complications:

	Complication # (%)	Total Rerears (%)	Rerears requiring surgical revision	Adhesive Capsulitis* (%)
Augmented	10 (12.3%)	4 (4.9%)	3	6 (7.4%)
Control	20 (12.3%)	11 (6.8%)	8	4 (2.5%)

- Occurrence rate for total complications was similar between the two groups (12.3%)
- Increased occurrence of post-operative adhesive capsulitis seen in the patch-augmented group is a concern, and should be addressed through further evaluation:

Cemented vs Cementless Reverse Total Shoulder Arthroplasty for Proximal Humerus Fractures: A Multi-Center Retrospective Cohort Study

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BACKGROUND

-Studies have demonstrated superior outcomes with the use of cemented reverse shoulder arthroplasty (RSA) for patients with proximal humerus fractures when compared to hemiarthroplasty.

-As implant options have expanded for the non-traumatic indications for RSA, cemented fixation has remained the standard of care for fractures.

PURPOSE

-The purpose of this study is to examine differences between cemented and uncemented reverse total shoulder arthroplasty used for proximal humerus fractures by examining the following outcomes: primary outcome of implant failure and secondary outcomes of surgical time, length of stay, and presence of peri-implant lucency on radiographs.

-Our hypothesis was that there would be no significant differences in surgical time, length of stay, postoperative outcomes with similar rates of implant failure and presence of peri-implant lucency on radiographs.

METHODS

-Multicenter, retrospective review of seven Level 1 and 2 trauma centers of all reverse shoulder arthroplasty performed for proximal humerus fractures between 2013 and 2020.

-Inclusion criteria included patients aged 18 years or older diagnosed with a proximal humerus fracture and treated with reverse total shoulder arthroplasty.

-Data was collected pertaining to demographic information, length of follow up, type of stem fixation used, operative time, blood loss, intra-operative complication, outcome scores, ROM, and post-operative radiographs.

-Categorical variables were reported using counts and percentages. Chi-square test was used when cell count was >5 and the Fisher exact test was used when cell counts were <5 for categorical variables. Continuous data was summarized using mean and standard deviation. For continuous variables, an unpaired 2-sample t test was used when the variable was normally distributed, and a Wilcoxon rank sum test was used when the variable was nonnormally distributed. Significance was set at $p < 0.05$.

RESULTS

-A total of 328 patients were identified for inclusion in the study. 178 patients with cemented stems and 150 patients with uncemented stems

-Patients were followed for an average of 58 weeks for cemented stems and 87 weeks for uncemented stems.

-Demographic data was similar between the two groups.

-No significant difference was noted in length of stay between the two groups ($p=0.46$).

-A significant difference in failure rate was observed between groups, with 12 out of 118 (10%) cemented stems experiencing failure, compared to 3 out of 133 (2%) uncemented stems ($p=0.03$).

-Average operative time was significantly lower by 34 minutes for uncemented stems (132 ± 52 minutes) compared to cemented stems (166 ± 51 , $p=0.0001$).

-Additionally, there was a significant difference noted in radiographic lucency at final follow up; 4 of 124 (3%) uncemented patients compared to 12 of 86 (14%) cemented stems ($p= 0.008$).

CONCLUSIONS

-Uncemented reverse total shoulder arthroplasty for treatment of proximal humerus fractures demonstrated superior failure rates, decreased operative time, equivalent length of stay, and decreased rates of radiographic lucency, when compared to cemented RSA.

-Limitations: As a retrospective study several variables could not be controlled, such as postoperative protocols or implant manufacturer. Heterogenous implant designs with various indications have the potential to impact failure rates. Longer follow-up, with a minimum of 104 weeks, is needed to truly determine differences in postoperative outcomes between uncemented and cemented RTSA.

Medical Students' Perspective on Pregnant or Parenting Colleagues



Spectrum Health



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Introduction

- Despite numerous barriers, there are many successful medical students who are pregnant or parenting
- Previous studies reveal limited institutional resources and support for these students^{1,2}
- Parental leave is rare in medical school³
- Delay of pregnancy due to career choice has been previously reported and there has been an upward trend in maternal age^{4,5}
- Medical students' opinions about pregnancy in medical school has not been reported

Methods

- Online, cross-sectional survey distributed to current medical students at Michigan State University College of Human Medicine (n=806)
- 55 optional questions regarding demographics, family planning, resources, and biases toward pregnant medical students
- Multiple choice questions with response options corresponding to strongly disagree(1), disagree(2), somewhat disagree(3), neither agree or disagree(4), somewhat agree(5), agree(6), and strongly agree(7)
- Mean and standard deviations calculated
- Two-tailed t-test conducted to compare male and female responses
- ANOVA conducted to compared medical student classes
- Statistical significance set at $p < 0.05$
- IRB Number: Study00008026

Results

- Response rate was 13.2% (n=106) and respondents were in 1st (n=29), 2nd (n=29), 3rd (n=36), and 4th (n=15) year of medical school
- Majority of respondents identified as female (76%)
- 3.8% had been pregnant during medical school, 4.8% were currently attempting to get pregnant, and most (61.7%) planned to have children

Figure 1: Reason for Delaying Pregnancy

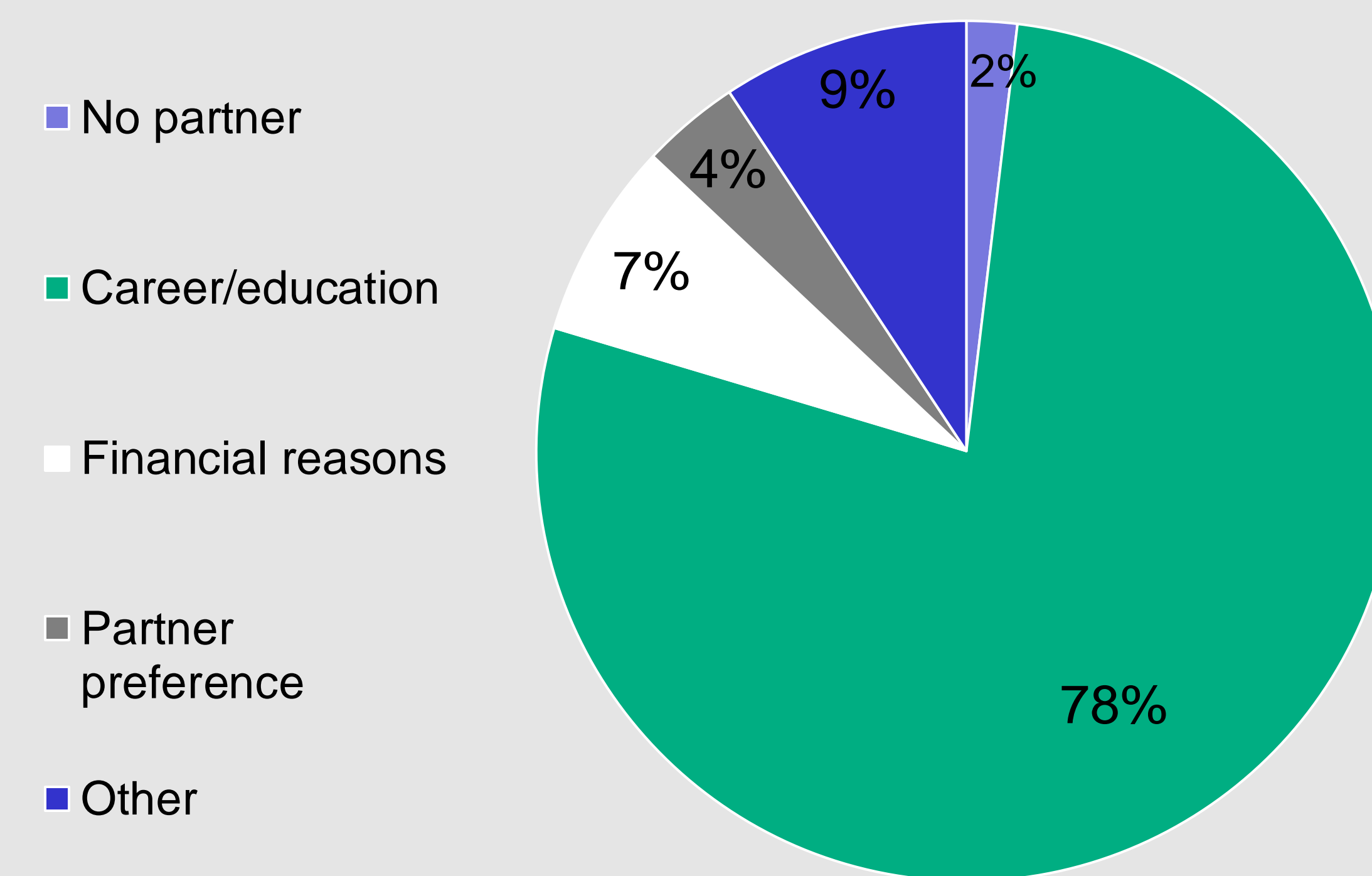


Figure 2: Pregnancy Resources in Medical School

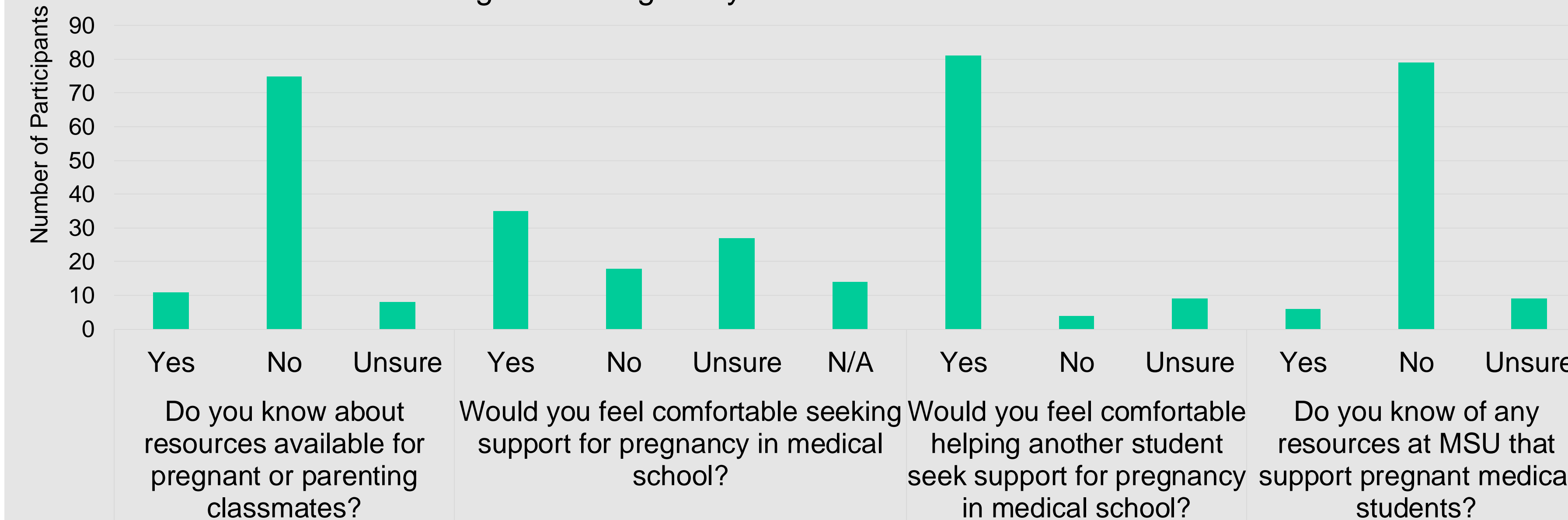


Table 1: Agree/Disagree Statements

Statement	Mean	Std Dev	Total
Pregnant medical students are resilient.	6.6	0.68	94
Pregnant medical students face additional challenges.	6.5	0.68	94
Parental leave should be available in medical school	6.4	0.97	94
Pregnant medical students are competent.	6.4	0.82	94
Pregnant medical students are trustworthy.	6.3	0.92	94
Pregnant medical students are more likely to experience bias than their fellow male parents.	6.2	1.22	94

Table 2: Bias During Pregnancy

Question	Classification	Number of participants	Percentage
Have you witnessed bias towards another student who was pregnant?	Yes	12	12.8
	No	71	75.5
	Unsure	11	11.7
If answered yes for the previous question, who did you witness portraying the bias?	Faculty	7	41.2
	Peer student	3	17.7
	Preceptor	1	5.9
	Other	6	35.3
If you have been pregnant in medical school, have you experienced bias?	Yes	1	20.0
	No	4	80.0

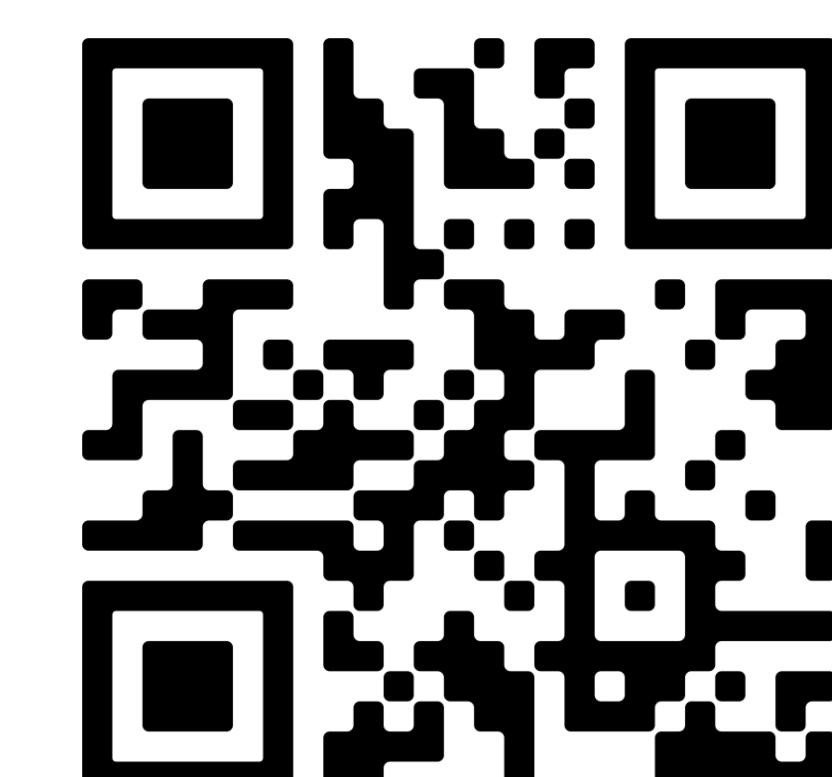
Results Continued

- 71.3% indicated their plans for having children would influence their medical specialty choice
- 66% reported choosing to delay pregnancy with 78% citing career and education as the reason
- 75% of respondents were not aware of resources available for pregnant or parenting classmates
- 86% agreed they would feel comfortable helping another seek support for pregnancy in medical school
- 12.8% of respondents had witnessed bias toward a pregnant medical student, with bias from faculty being the most common at 41.2%
- For the statements, "pregnant medical students are more likely to experience bias than their fellow male classmates who are parents" and "pregnant medical students face bias", females had significantly higher scores than males, indicating stronger agreement, whereas males had higher scores for the statement, "pregnant medical students feel supported" ($p < 0.05$ for all)

Conclusion

- Pregnant medical students face additional challenges and bias
- Students believe parental leave should be an option in medical school
- Delay in pregnancy for medical students is most commonly due to career or educational goals
- To promote equity and inclusion in medical education and specialty choice, efforts are needed to support students who are pregnant or parenting by decreasing existing biases and offering parental leave.

References



Difficult Airway Secondary to Squamous Cell Carcinoma of the Tongue



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Introduction

Airway management is a fundamental pillar of anesthesia, and the consequences of encountering a difficult airway can lead to significant morbidity and mortality.¹ Understanding predictive factors and using preoperative assessment tools is crucial for the preparation of a known difficult airway; however, 93% of difficult airways are unanticipated, and only 25% of suspected difficult airways will turn out to be difficult.³ Notably, head and neck cancer is reported as a predictor of a difficult airway.² Because of the unreliability of the assessment tools, understanding the difficult airway algorithm is essential for the management of difficult airways.

Case History and Examination

- A 36-year-old male with a PMH of squamous cell carcinoma (SCC) of the tongue requires a gastrostomy tube (G-tube) placement.
 - Diagnosed with stage IV invasive SCC of the tongue 5 weeks prior and elected for chemoradiation. The patient had been experiencing dysphasia, dysphagia, and pain.
 - Open G-tube indicated due to failed percutaneous attempt.
 - Patient subsequently presented to the Emergency Department with severe pain, malnourishment, and dehydration. An urgent G-tube placement was indicated.
- With an expected difficult airway, equipment was prepared, and multiple providers were present to ultimately intubate the patient with a GlideScope and fiber optic bronchoscope (FOB).
 - Patient was described as a Mallampati II prior to intubation.
- After placement of the G-tube, patient was readmitted on post-op day 6 in septic shock due to dislodgement of the G-tube.
 - Patient was started on fluids, empiric antibiotics, and prepared for laparoscopic gastropexy.
 - The airway was described as a Mallampati IV, likely due to progressive obstruction from his SCC and recent difficult intubation causing inflammation.

Intubation Attempts

A total of 5 intubation attempts were made:

1. McGrath 4, no discernable landmarks aside from epiglottis. NG tube removed. Endotracheal tube (ETT) was inserted over bougie, but removed.
2. GlideScope 3, no view of vocal cords. Asked for a FOB to be prepped and additional anesthesiologists called in.
3. Glidescope 3, different provider, but no view obtained.
4. GlideScope 3 with FOB, intubation was attempted, ETT encountering significant resistance. A decision was made to start awakening the patient.
5. Glidescope 3 with FOB, final attempt while preparing to awaken patient. Successful ETT placement with head lifted from bed. Bag-valve-mask ventilation was possible throughout all attempts, maintaining the patient's oxygenation and ventilation. Vitals were stable throughout this difficult intubation.

Discussion/Conclusion

In our case, with the initial intubation attempts failing, the difficult airway algorithm was followed, and help was quickly called for. This case illustrates the importance of understanding and executing the difficult airway algorithm and how risk factors and predictive tests may help anticipate a difficult airway.

We do not yet have great tools to predict which patients will have a difficult airway and providers must be vigilant and prepared for an unexpectedly difficult airway. Predicting a difficult airway is complex; multiple factors such as anatomy, body habitus, medical history, and underlying medical conditions must be considered. Despite the evaluation of these factors, predicting a difficult airway can still be challenging. There is no single definitive test or screening tool that can accurately predict a difficult airway in all patients. Even the most experienced anesthesiologists may encounter unexpected difficulties during intubation.

The algorithm provides a structured approach for managing difficult airways, which are often unexpected. It empowers providers to make informed decisions based on individual patient needs in critical scenarios, mitigating associated risks and complications, and ultimately improving patient outcomes and survival rates.

Difficult Airway Algorithm

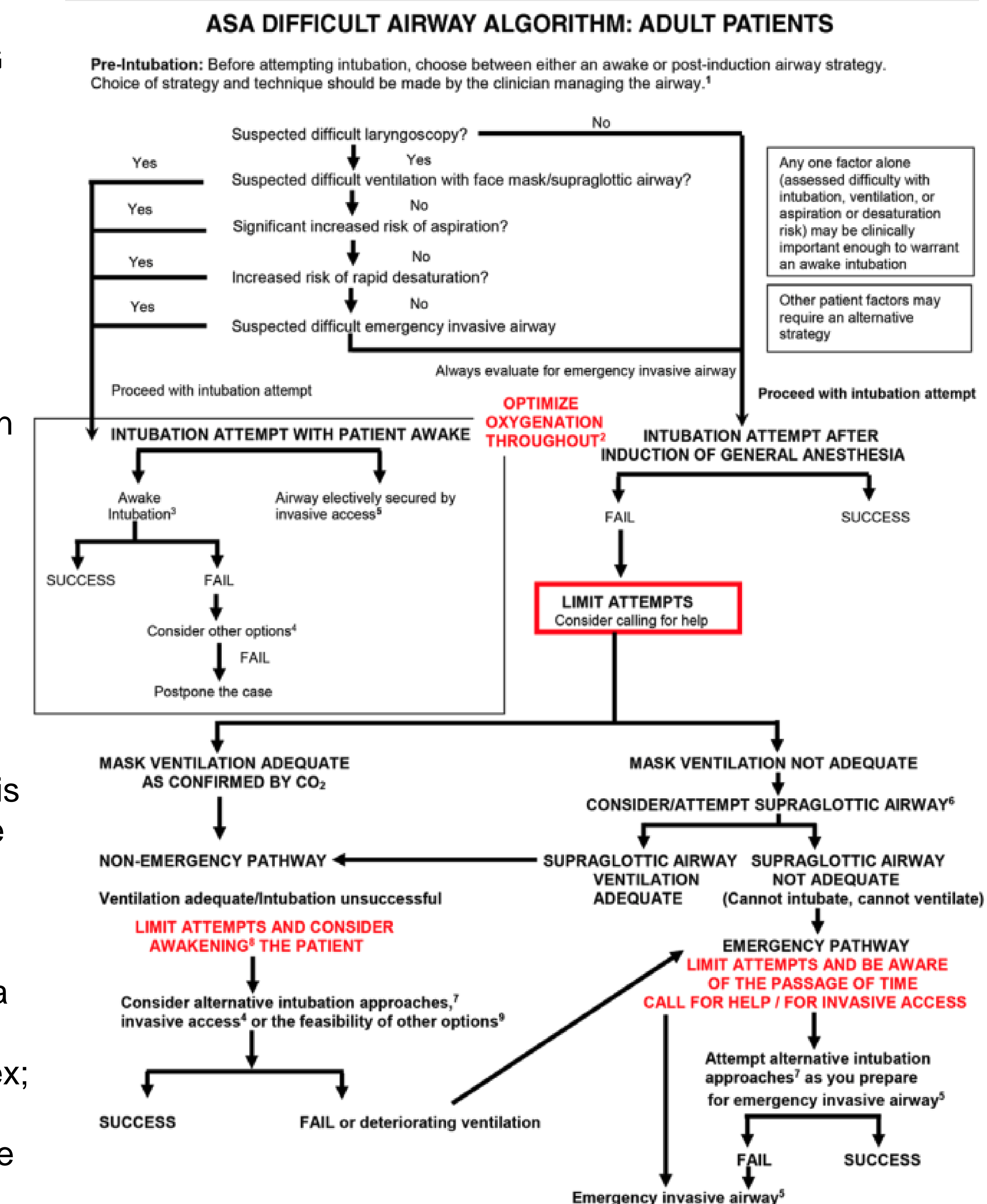


Figure 1: Difficult airway algorithm: Adult patients⁴

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Unexplained Delayed Emergence from General Anesthesia

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Background

- Delayed emergence is present when a patient fails to regain consciousness following the administration of general anesthesia
- Most patients demonstrate a return to wakefulness within 30 minutes of the cessation of general anesthesia
- Here we discuss a case of delayed emergence for which the etiology was not readily identified

Case Report

- 28 y.o. woman presented with abdominal pain
- No PMH/PSH, home medications/allergies
- Laparoscopic left salpingectomy for ectopic pregnancy
- Received uncomplicated general endotracheal anesthesia: fentanyl, midazolam, propofol, ketorolac, rocuronium, sugammadex, and sevoflurane
- Extubated “deep” without incident
- In PACU patient remained unresponsive, did not emerge as expected from anesthesia
- Hemodynamically stable. No gag, no cough, no withdrawal of extremities to painful stimuli, pupils equal and reactive. Physical exam otherwise wnl
- Patient demonstrated dysconjugate upward gaze concerning for seizure. Lorazepam administered, patient intubated, head CT and CTA head/neck obtained with no concerning findings

Etiology	Evaluation in PACU
Residual Medication <ul style="list-style-type: none">• Agent• NMB• Opioid• Benzodiazapine	Sevoflurane off >30 minutes Appropriate reversal dose, ToF 4/4 Naloxone administered Flumazenil administered
Hypoxemia	Normoxia (SpO2 98%)
Hypercarbia	Normocarbic (39 mmHg)
Hypothermia	Normothermic
Metabolic Derangement <ul style="list-style-type: none">• Hypo/hyponatremia• Hypo/hyperglycemia	Na 137 Glucose 106
Neurologic Injury	CT H negative, CTA H/N negative
Medication/Monitoring error	No concern upon review

- Patient admitted to neuro ICU where long-term EEG demonstrated no seizure activity
- On POD1, the patient was successfully extubated and demonstrated normal cognitive function, neurologic exam wnl, and no recall of the events

Discussion

- Residual neuromuscular blockade was unlikely as the chemical paralysis had been fully reversed prior to extubation with appropriate motor function at the time of extubation
- As a diagnosis of exclusion, residual effect of volatile agent (sevoflurane) is a possible although poor explanation
- Genetic variation of an enzyme responsible for metabolism of propofol (e.g. CYP2B6)¹ or sevoflurane (e.g. CYP2E1)² is also a possible explanation

Conclusion

This case provides a review of the workup for delayed emergence from general anesthesia. Furthermore, the patient’s course demonstrates that not all medical abnormalities have an identifiable cause, but that the “tincture of time” with supportive care is occasionally the appropriate therapy

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Introduction

- Incidence of pulmonary embolism (PE) in adults in the U.S. is 60-70 per 100,000, but only 0.14-0.9 per 100,000 in the general pediatric population.

- Current risk stratification for pediatric, adolescent, and young adult (PAYA) population is largely extrapolated from adults.. It is unclear if assessment of right ventricular strain (RVS) and cardiac biomarkers (Troponin) have the same implication in PAYA patients as in adults.

- Catheter based treatment for intermediate and high risk PE in adults is frequently done using catheter-directed thrombolysis (CDT) or mechanical embolectomy (ME), with high degree of safety and efficacy.

- There are very few series of CDT in PAYA patients and only isolated case reports of ME.

Methods

Retrospective chart review of patients 25 years of age and younger presenting with acute PE treated at Corewell Health West (formerly Spectrum Health) and Helen DeVos Children's hospital between 08/01/2012 and 09/01/2022, using either "EKOS", the Ekosonic System (Boston Scientific, Marlborough, MA) for CDT or the FlowTrieve System (Inari Medical, Irvine, CA) for ME.

Results

Demographics (n = 25)

- 19 females, 6 males.
- Average age 19.8 (range 15 - 25)

Risk Factors

- 14 F on estrogen-containing contraception
- 2 F recent post partum (3 and 5 days)
- 1 F pregnant at time of PE
- 20 meet obesity criteria
- 7 with documented genetic thrombophilia
- 1 COVID (+) at time of PE

Risk category per European Society of Cardiology

- 2 High risk (hemodynamically unstable)
- 17 Intermediate-high risk (RVS + Troponin)
- 4 Intermediate-low risk (RVS or Troponin)
- 2 Intermediate (not further characterized)

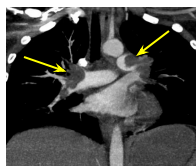
Treatment

- 14 treated with CDT
- 11 treated with ME

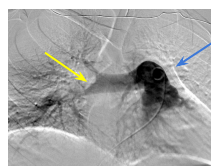
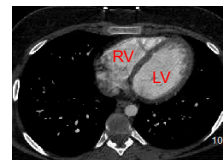
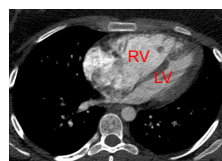
Results Continued

CDT with EKOS

Pre-treatment



Post-treatment



Top Left
Large emboli in R/L PA on initial CTA

Top Right
PE Resolved on follow up CTA

Middle Left
RV/LV = 2.0 - initial
(normal RV/LV < 0.9)

Middle Right
RV/LV = 0.7 - follow up

Bottom Left
Yellow - large PE in R PA, Blue - no flow to L lung. Mean PAP 38 mmHg.

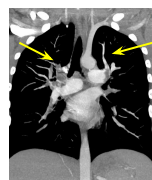
Bottom Right: Partial lysis after CDT, improved flow. Mean PAP 22 mmHg.

Length of stay for CDT cohort

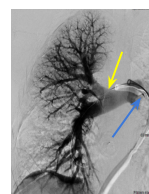
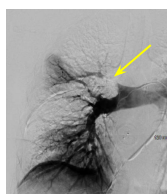
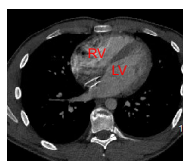
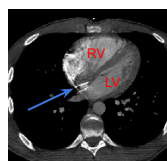
- ICU mean 1.9 days (range 0 -6d)
- Overall mean 7.7d (range 3-12d)
- Post CDT mean 5.8d (range1-10d)

ME with Inari FlowTrieve

Pre-treatment



Post-treatment



Top Left
Large emboli in R/L PA on initial CTA

Top Right
PE Resolved on follow up

Middle Left
RV/LV = 1.7, initial
Blue - PFO occlusion device

Middle Right
RV/LV = 0.8, follow up

Bottom Left
Large central PE in R PA with poor R lung perfusion. Mean PAP 23 mmHg.

Bottom Right
Central PE removed with improved flow post ME. Mean PAP 13 mmHg.
Blue - FlowTrieve catheter

Length of stay for ME cohort

- ICU mean 0.6 d (range 0-3d)
- Overall mean 3.7d (range 1-6d)
- Post ME mean 2.7d (range 1-5d)

Procedural Outcomes

- Mean change in Pulmonary Artery Pressure (PAP): 10 mm Hg (pre treatment mean of 30 mm Hg decreased to mean of 20 mm Hg post treatment).
- Zero bleeding complications or other adverse procedure-related events
 - 1 Death (5 days post CDT, not procedure-related)
 - 1 recurrent PE, 6 days post CDT

Long Term Outcomes

- Clinical follow up found to be inconsistent
- Of the 24 patients with follow up clinical information, none had persistent signs or symptoms of PE-related cardiopulmonary dysfunction during mean follow up interval of 34 months (range 4-122 months), although prior history of PE was frequently not described during visits for unrelated issues.

Conclusion

- Both CDT and ME can be done safely in PAYA patients with favorable reduction of PAP and excellent survival in Intermediate and high risk PE

- ME may offer advantages over CDT by minimizing or eliminating the need for ICU stay, decreasing overall and post treatment LOS, as well as avoiding potential risk of administering a thrombolytic drug (although no bleeding events were encountered in the CDT patients in this series).

Looking Forward

- Development of a standardized evaluation for PAYA PE patients is encouraged, and establishment of multidisciplinary Pulmonary Embolism Response Teams (PERT) should be considered.

- Standardized algorithms should be adopted in PAYA patients with acute PE for diagnosis, risk assessment, treatment alternatives, and clinical follow up. Standardized clinical assessments, imaging follow up, and quality of life surveys are important for determining optimal treatments.

- Long term outcome studies are needed for PE in PAYA patients, including those who receive CDT, ME, anticoagulation alone, or other treatment methods.



The Effect of Obesity on Arthritic Changes Following First Tarsometatarsal Joint Fusion as Treatment for Forefoot Deformity

Nicole Ambrosio, OMS-3; Ethan Poland, OMS-1; Alejandro Leon; Matthew Gibbs, DO; Sean Beyer, DO; Samuel Perry, DO; Isaac Majors, MD; Marshall Boose, DO; John G. Anderson, MD; Donald R Bohay, MD, FACS; John D. Maskill, MD; Michelle A. Padley, PhD; Lindsey A. Behrend, BS

Background

Obesity and Surgical Outcomes: Obesity (defined as a body mass index of over 30), has reached epidemic proportions affecting not only high-income countries but low- and middle- income countries as well. The current estimate is at least 2.8 million people dying each year due to being obese. This plays a factor into orthopedic surgery by affecting bones and soft tissue at the biomechanical and biochemical levels. At the biomechanical level obesity causes increased load bearing upon the joints. Biochemically the elevated level of adipose tissue leads to increased inflammatory markers deterring the wound healing process. There is a link between pro-inflammatory cytokines and arthritic changes.

Purpose: Current literature has looked at rates of post-surgical site infections and corrective surgery following a hallux valgus correction. This retrospective data collection was evaluated to determine if obesity plays a factor into arthritic changes following a first TMT arthrodesis.

Hallux Valgus (HV): Commonly referred to as a “bunion,” HV presents clinically as a bony prominence at the base of the big toe that can be particularly painful for shoe wear. This is due to the head of the first metatarsal bone medial drift from that of the second metatarsal bone. As many as 20% of US adults will develop HV in their lifetime. The resulting deformity is not only painful, but the affected foot will have improper mechanics.

Conservative interventions, such as a shoe with a wide toe-box, are meant to alleviate the symptoms of HV. Due to the structural nature of this deformity, many patients eventually seek surgical treatment.

Fusion of the First Tarsometatarsal (TMT) Joint: This approach is more targeted to the structural cause of the deformity as compared to other surgical interventions. The first metatarsal head is moved back to its proper position, and the bone is stabilized in this proper alignment by fusing its proximal articulation (the First TMT Joint).

Hypothesis: Obesity and correlated comorbidities will contribute higher rate of arthritic changes following a first TMT arthrodesis.



Body Mass Index (BMI) Reference Scale

Methods

This study is a retrospective chart review at a tertiary foot and ankle clinic, performed on subjects 18 years of age or older who received a first TMT fusion between January of 2004 and December of 2017 by the Foot & Ankle Surgeons at Orthopaedic Associates of Michigan (OAM).

Exclusion Criteria

- Additional TMT fusions in the same foot
- History of proinflammatory disease
- History of trauma to the same foot
- History of metatarsal osteotomy in the same foot
- History of ankle/hindfoot fusion procedures in the same foot
- History of ankle arthroplasty on the same side

1371 patient charts fit the inclusion criteria. Of these, 899 are included in this exploratory analysis.

Arthritis Evaluation

- Based on radiologic evidence (X-Ray, CT, MRI)
- Images assessed by orthopedic surgical residents of University of Michigan Health-West and OAM Foot & Ankle Fellows

Surgical Technique

- If present for Gastrocnemius equinus with the Silfverskiold test, the gastrocnemius tendon was sharply released either through a medial or posterior approach with the sural nerve protected.
- A dorsal longitudinal incision was made over the first TMT joint just lateral to the extensor hallucis longus and the dorsomedial cutaneous nerve.
- The first metatarsal was placed in the desired position to correct the deformity. Compression across the first TMT joint was achieved with two 3.5-mm cortical lag screws. The 1-2 intermetatarsal space and the 1-2 intercuneiform joint were compressed and each stabilized with a 3.5-mm cortical positional screw.
- Final implant placement was confirmed by fluoroscopy. Finally, a burr was used to create a small trough across the fusion surfaces which was filled with local bone graft as a “spot weld” to help promote union.



Right Foot Pre-Operative X-Rays (AP and Lateral Views)

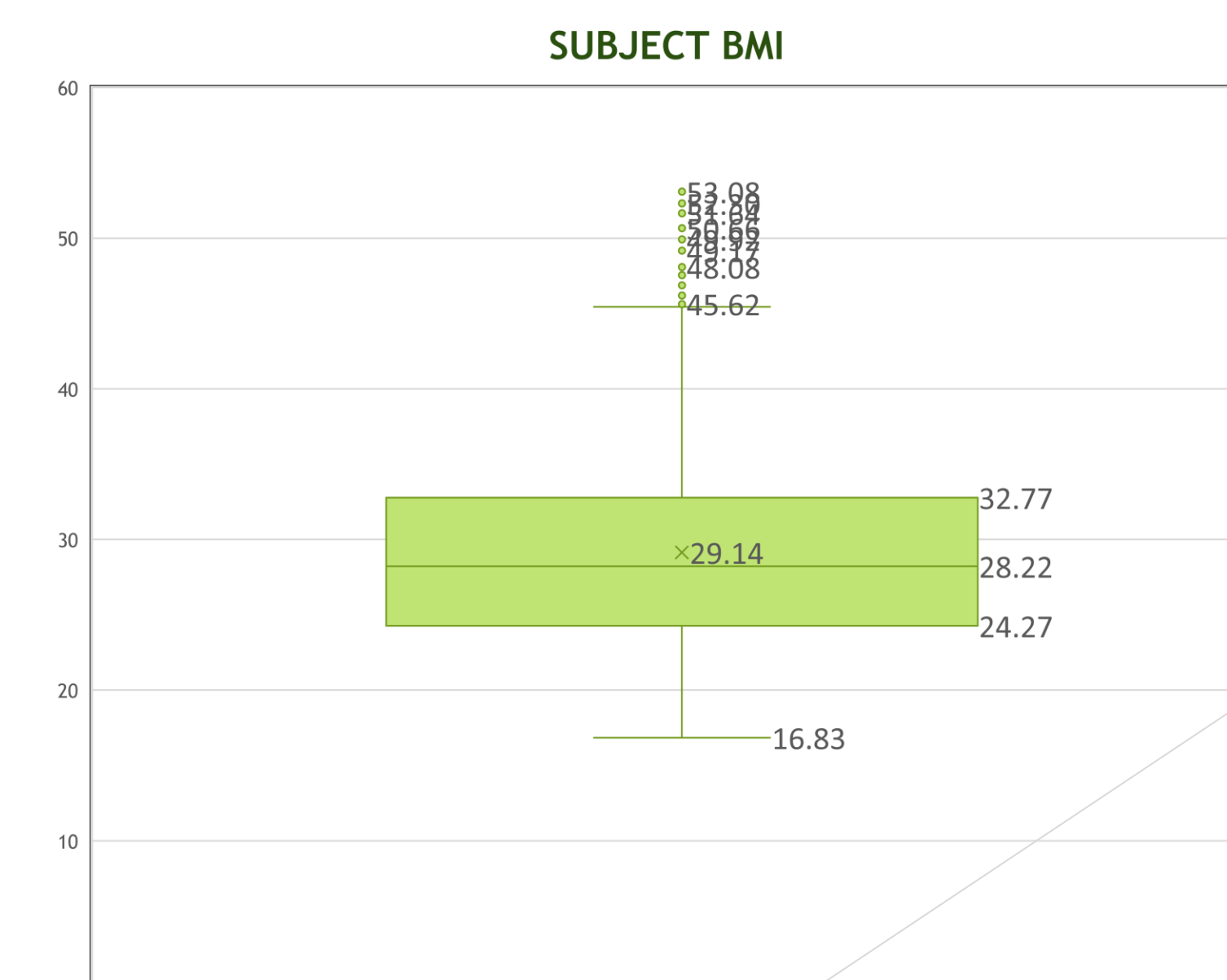
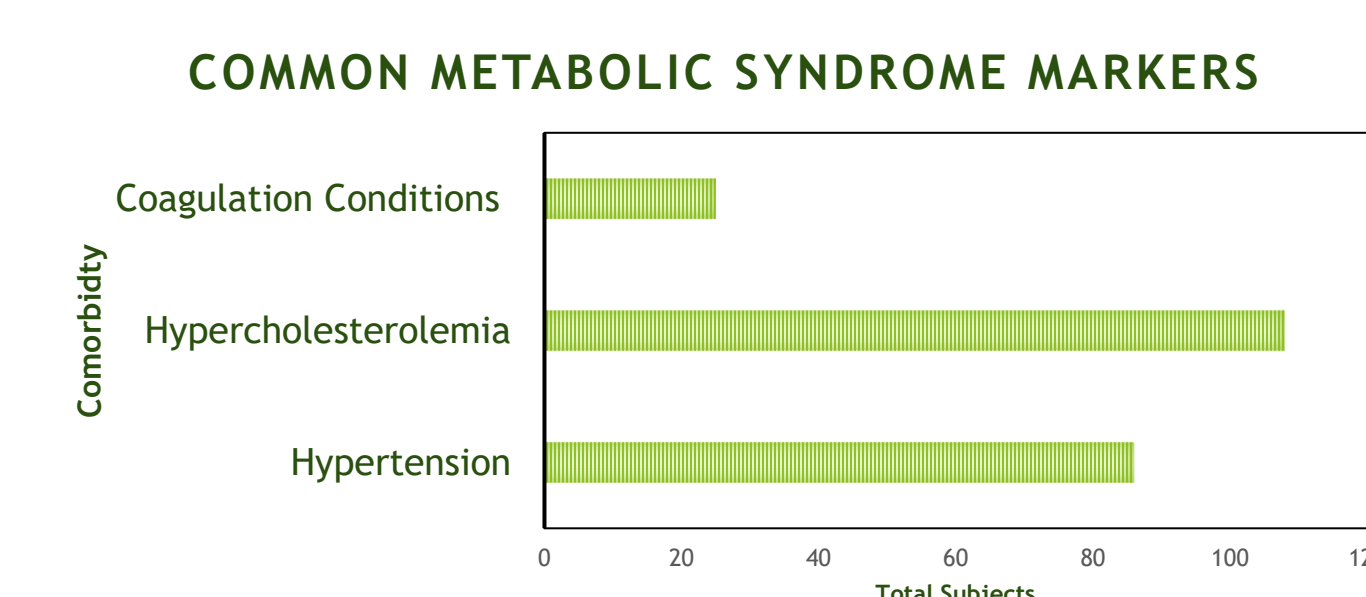
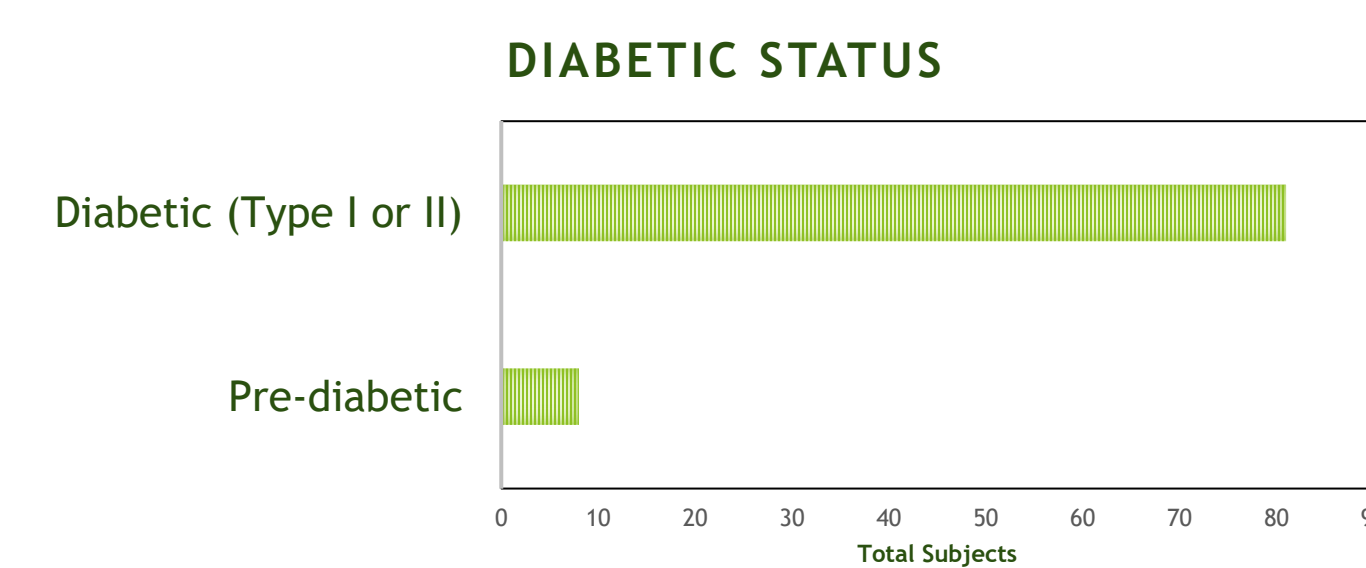


Right Foot 12 Month Post-Operative X-Rays (AP and Lateral Views)

Preliminary Data

Summary statistics will be calculated for the data. Quantitative data will be expressed as the mean +SD, while nominal data will be expressed as a percentage. Comparison of study cases and controls will be Pearson Chi-squared and student's t-test. The odds ratio will also be determined for factors found to be significant.

Selected Demographics of Patients Who Developed Adjacent OA					
	Total	Avg. Age at Surgery	Avg to OA (years)	Percentage with Smoking Hx	Avg. BMI
NC Arthritis	7	55.7	3.28	0.29	36.3
TN Arthritis	9	57	3.04	0.56	30
Both	2	44.5	1.22	1	31.5



Discussion

- Based on the preoperative BMI of the 18 patients who developed arthritis, eight (8) were morbidly obese, two (2) were obese, four (4) were overweight, and only four patients (4) were of normal weight. 77% of the people so far identified as developing arthritic changes following a TMT arthrodesis were considered an unhealthy weight.
- For comorbid conditions analyzed, one (1) patient had diabetes, four (4) patients had high cholesterol, four (4) patients had hypertension, and one (1) patient had a coagulation disorder.
- The preliminary data suggests that increased BMI and other associated comorbidities of excess weight might be contributing to arthritic changes following a TMT arthrodesis rather than post-operative biomechanics of the foot.
- Future plans of this project will be complete the radiographic data for all 899 patients and evaluate if obesity and comorbidities associated with obesity lead to increased levels of arthritic changes.
- With complete radiographic evaluation having been performed on 197 of our 899 patients included in this study, we can preliminarily report a roughly 9% incidence rate of adjacent joint arthritis following first TMT fusion (18/197).
- At this time, we are unable to conclude that a first TMT arthrodesis inherently increases one's risk of developing OA in the adjacent joints of the same foot.

Limitations

- This study was completed at a single private practice center. Given our sample size and patient population, this study may be susceptible to selection bias and may not be representative to generalizable populations.
- Adjacent joint arthritis determinations were made radiographically, and not necessarily based on symptom presentation. This begs the question of how large the limit is, with respect to the accuracy of any attempts to estimate normal population prevalences of foot arthritis. The vast majority of these estimates are based on patients who present with symptomatic arthritis. One must assume these estimates are under-calculations. Thus, it is difficult to approximate the standard population rate of arthritis development in the adjacent joints of interest in this study.

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Incidence of Injury and Disposition from Hospital of Pediatric Femoral Fractures Over the Past 10 years

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Introduction

- Femoral shaft fractures tend to be rare among children and adolescents, however, these injuries are still the most common major pediatric injuries that are treated by orthopaedic surgeons [1][2][3]
- In the 6 months to 6-year age range a hip spica cast is frequently the preferred treatment option. This cast typically encompasses the pelvis and extends down one or both lower extremities [4]
- This treatment poses major challenge to caregivers with regards to hygiene, daily activities, and transportation due to the size and positioning imposed by the cast [5][6]
- The purpose of the study is to characterize trends in causes of unintentional femoral fractures in the pediatric hip-spica aged population over the past 10 years. It is important to characterize the current incidence, demographics, location of the injury event, disposition of patients and activities associated with femoral fractures among young children, which can be useful in developing injury prevention strategies and caregiver education.

Materials & Methods

- Data from 2012 to 2021 from the National Electronic Injury Surveillance System (NEISS) maintained by the Consumer Products Safety Commission were obtained. This data set documents emergency department visits for a sample of sites across the US to estimate national rates for unintentional injuries associated with consumer products. These products range from flooring to toys and include motorized products such as dirt bikes but exclude passenger vehicles.
- Weighting factors provided in the data set allow estimation of national rates of injury. Data from this source were screened to identify cases involving children aged 6 months through 6 years.
- The narrative descriptions for the injury cases were searched for keywords to identify common factors in the injury events. Common injury locations (home, school, sports/parks), persons involved in the event (family members or other caregivers identified by keyword searches) and injury sources were obtained. From the injury source data groups were constructed for group sporting activities that would likely involve potential for person-to-person interactions (e.g., baseball, football, dance) and activities involving motorized items (ATV, UTV, motorbike, motorcycle, golf cart, lawn tractors, etc).
- Demographic and descriptive information was obtained from the data set using the "Surveyfreq" tool in SAS (Cary, NC) to account for the stratified sample design and sample weights. Comparisons between groups were performed using a Rao-Scott chi-square test to account for the stratified sample design

Results

- 2820 cases representing an estimated 53,039 cases in the USA over 10 years 2012-2021. Estimated rate of 23.5 cases per 100,000 children in the USA based on 2020 census data.
- There is a higher percentage of boys (63.9%) than girls (36.1%) involved in cases. There was no difference in frequency of femoral fractures from 2012-2021.
- In regard to patient disposition, the largest group (45.15%) were treated and admitted. Only 3 cases reported as left without being seen. Overall, an estimated 24.10% were transferred, with small hospitals transferring 25.5% of cases, medium 52.7%, large, 22.9%, and very large and children's hospitals transferring the lowest amounts at 14.6% and 0.1% respectively.
- Regarding the location of injury, 58.36% of the fractures occurred at the patient's home with unknown location (22.9%), sports/playground (9.9%), and then school (3.3%) following as the most common location for injury.
- Family members were mentioned in the narrative description of the event 28.4% of the time while teachers/non-family caregivers were mentioned in only 2.9% of cases.
- Fractures involving group sports and motorized items were indicated as injury sources for 5.7% of cases, with bed/bunk beds (16.1%), floor (slips/falls, 9.7%), and trampolines (9.7%) being the most frequently indicated sources.

Figure 1

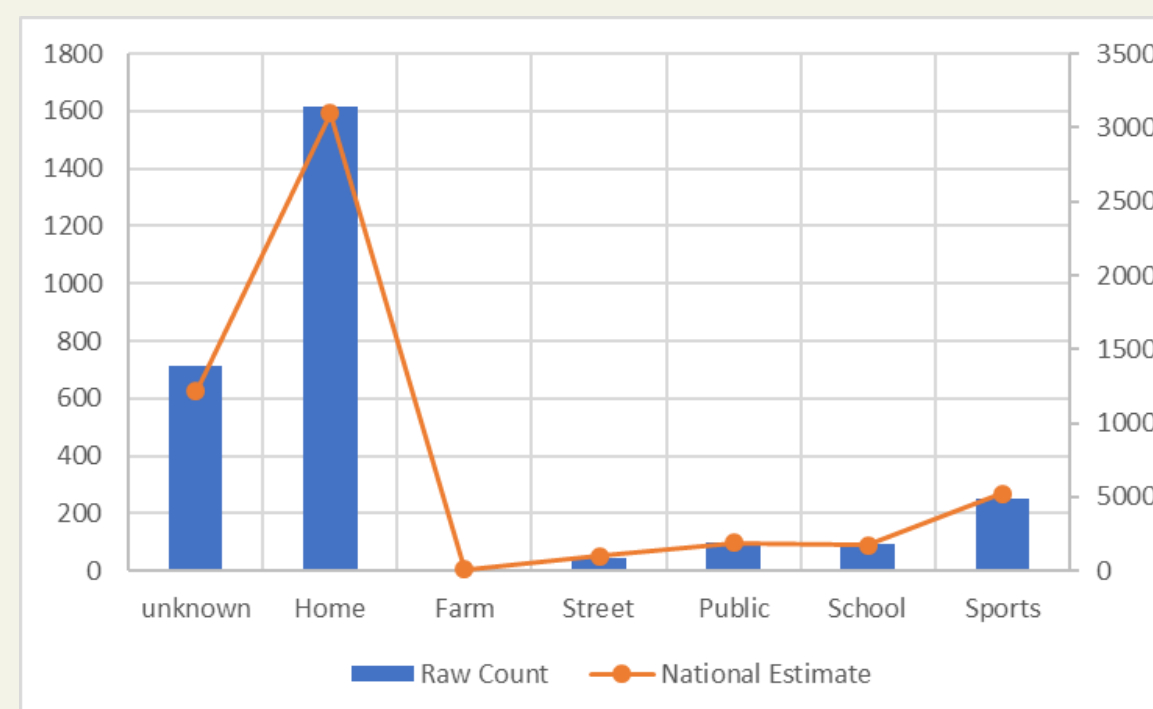


Figure 1: Graph showing the number of cases that occurred in different locations of injury both as a raw count and as a weighted national estimated. This graph shows that "home" is the most frequent location where injuries occurred, although "unknown" was the second most common location. This is followed by "sports," "school," "public," "street," and finally "farm" in order of most to least common location of injury.

Discussion

- The overall frequency of injuries has been consistent over the past 10 years despite the COVID-19 pandemic. It appears that boys continue to sustain more injuries which remains in line with historical data.
- For all age groups "Home" is the most common location of injury and family members were mentioned in about 1 in 4 cases
- Another common location of injury identified was "sports" which is another area where increased safety measures, such as adult supervision, can be implemented.
- A large portion of the patients at small and medium institutions were being transferred raising the question of is there a lack of resources or training to treat patients at these institutions

Conclusion

- In conclusion, the overall frequency of injuries has been consistent over the past 10 years despite the COVID-19 pandemic, which is in line with the fact that "home" is the most common location of injury and family members were mentioned in about 25% of the cases.
- Effective prevention methods should be geared towards family members or parent education and may include things such as pamphlets/handouts given at pediatric conferences or more detailed safety instructions on products.

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Are Missed Enoxaparin Doses Associated with Increased VTE Rates in Polytrauma Patients?



Spectrum Health



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Background

- Deep vein thrombosis (DVT) and pulmonary embolism (PE), referred to as venous thromboembolism (VTE), are a significant source of morbidity and mortality in hospitalized trauma patients.
- Enoxaparin, has been shown to be efficacious in reducing VTE rates.
- Trauma patients often require surgery or procedures with risks of bleeding, leading to withholding enoxaparin doses.
- The purpose of this study is to quantify the increased risk of VTE associated with missed doses of enoxaparin after initial dosing is withheld for procedures.
- There is a lack of literature addressing increased bleeding complications if enoxaparin is not withheld in patients undergoing necessary procedures.

Methods

- This was a retrospective study that evaluated trauma patients admitted to Corewell Health West Butterworth Hospital during the study period from January 1, 2012 – January 31, 2021.
- Total number of enoxaparin doses and number of missed doses after an initial dose were recorded.
- A 1:1 propensity match was performed on patients that did and did not have a VTE event.
- Wilcoxon rank sum test was used for numeric variables and chi-square was used for categorical variables. Bonferroni correction was applied to adjust for the number of tests performed.
- Secondary outcomes examined rationale for missed doses, hospital length of stay, and other complications.

Results

- 493 patients were administered prophylactic enoxaparin during their hospital stay.
- 106 patients experienced a VTE and 387 did not experience a VTE.
- 92 patients were analyzed after propensity score matching.
- There is a difference in the median number of missed doses between the VTE and non-VTE group, shown by Figure 1.

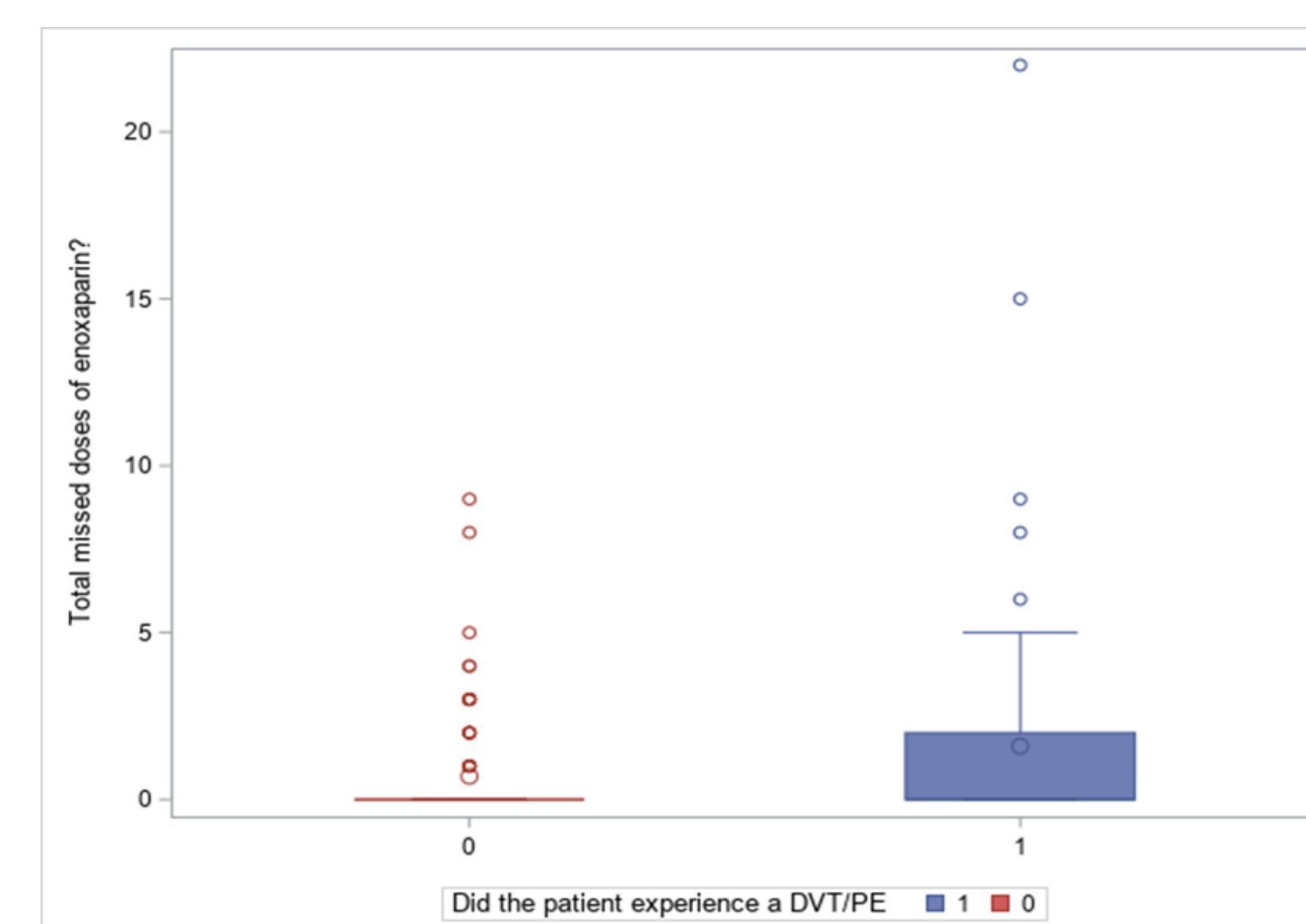


Figure 1. The VTE group has a 75th percentile that extends out to 2 doses, which indicates that the middle 50% of the data falls between 0 and 2.

- A univariate logistic regression model was developed to assess the odds ratio of a VTE in relation to the number of missed enoxaparin doses during a patient's hospital stay, shown by Table 1.
- Table 2. shows the differences in various outcomes for patients who experienced a VTE and those who did not experience a VTE – note all outcomes are statically significant.

Table 1. Odds ratio risk of VTE when compared to zero missed doses of enoxaparin.

Number of missed doses	Odds Ratio (95% CI)
1	1.213 (1.043, 1.466)
2	1.472 (1.089, 2.148)
3	1.786 (1.136, 3.149)
4	2.167 (1.186, 4.616)
5	2.629 (1.237, 6.766)

Table 2. Outcome differences between VTE and non-VTE groups after propensity score matching.

Variable	Overall (N = 184)	No DVT/PE (N = 92)	DVT/PE (N = 92)	p-value
	Ventilator Days	0 (0, 1)	0 (0, 0)	
Hospital Length of Stay	6 (4, 11)	4 (2, 5)	10 (6.5, 16.5)	<0.0001
ICU Length of Stay	1 (0, 4)	0 (0, 1)	2 (0, 8)	<0.0001
Schedule enoxaparin doses	6 (3, 11)	5 (3, 9)	7 (3, 16)	0.007
Did the patient miss any doses? (Yes)	65 (35.3)	22 (23.9)	43 (46.7)	0.0012
Total missed doses of enoxaparin?	0 (0, 1)	0 (0, 0)	0 (0, 2)	0.0018

Discussion

- Data from this study shows there is an increased risk of VTE when enoxaparin is held.
- There is a significant difference in proportions of patients who had a VTE and missed a dose of enoxaparin compared to those who had a VTE without missing a dose, shown in Table 2.
- Specifically, 46.7% of patients had a VTE and missed a dose while only 23.9% of patients had a VTE and did not miss a dose.
- Figure 1 visualizes the significant difference in the median number of missed doses between the VTE group and the non-VTE group.
- Patients who missed a dose of enoxaparin were 1.2 times more likely to experience a VTE than patients who missed no doses, demonstrated in Table 1.

Conclusions

➤ Our study shows that multidisciplinary teams managing polytrauma patients must weigh the risk of bleeding during procedures with the increased risk of VTE when holding enoxaparin for those procedures.

➤ This is especially true when more than one dose of enoxaparin is to be held during the hospital stay, as the risk of VTE increases with every dose held.

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Parental Attitudes Towards the COVID-19 Vaccine and its Impacts on Well-Child Visit Attendance



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ABSTRACT

Assessing parental attitudes towards in-person well-child checks and the COVID-19 vaccines during a time of hesitancy and rapidly changing CDC recommendations is essential in providing high quality care for children. Survey data was collected from guardians of children between newborn and age eighteen at Pediatric clinics in the Greater Lansing Area and schools across the state of Michigan. We found that the education level of the guardians and the critical window of the children cause different attitudes towards complying with the recommended in-person well-child checks and the COVID-19 vaccines. The initial study data analysis suggests the education level of the guardians has no correlation with compliance while the increased age of the children has negative correlation with compliance from guardians. The follow-up study data analysis suggests a decreased risk of severe illness from the COVID-19 virus, along with major concerns about COVID-19 vaccine complications, has negative correlation with compliance from guardians. We believe this is a multifactorial outcome due to barriers within academia and media portrayal, the autonomy and independence children get with increased age, as well as the changes in SARS-COV-2 virus variants and challenges keeping up with new COVID-19 vaccines and the vaccination schedules.

METHODS

Design: Primary (n=78) and follow up questionnaires (n=315)
Population: Parents and guardians of children between the ages of newborn to 18 years
Recruitment: Two clinics in Lansing, MI that were associated with Michigan State University and were exclusively pediatric clinics.
Measurement: Multivariate analysis, conditional formatting, regression models. Data outputs were displayed as percentages and fractions. Descriptive analysis was provided with graphs and a categorical association correlation test was run to determine relations between variables of interest.

Questions Addressed in the Surveys

Are you or anyone in your household at high risk of complications from COVID-19?
Do you find it important to bring your child into the clinic for every recommended well-child check?
Have you canceled or rescheduled any well-child checks since December 2019?
How comfortable are you bringing your child in for a well-child check now or in the near future?
How do you feel that COVID-19 has impacted your child's health?
How likely are you to agree to receive information on the COVID-19 vaccine?
Is your child up-to-date on vaccinations besides the COVID-19 vaccine?
How likely are you to bring your child to receive a COVID-19 vaccine?
Do you have any concerns about the COVID-19 vaccine side effects or complications?

RESULTS

Categorical association showed:

- Age of the patient positively correlates with the missing appointments while negatively correlates with how the patient is impacted from COVID-19. (p<0.05)
- If there is a household member that is high risk for COVID-19 complications there is an increase on missing appointments. (p<0.03)

Percent analysis showed:

- 61% of parents did not cancel or reschedule any well-child checks since December 2019
- 52.5% of parents were concerned that their child was at a high risk of exposure to COVID-19
- While 78.6% of parents stated their child is up to date on all immunizations besides the COVID-19 vaccines, only 63% would agree to bring their child in for a COVID-19 vaccine
- Concerns about the vaccine's complications is the main reason for pushback from 42.4% of parents

Figure 1. Percentage analysis for missed, canceled/rescheduled visits due to COVID-19, and perceived impact on child's health by guardians that completed vocational and secondary education programs.

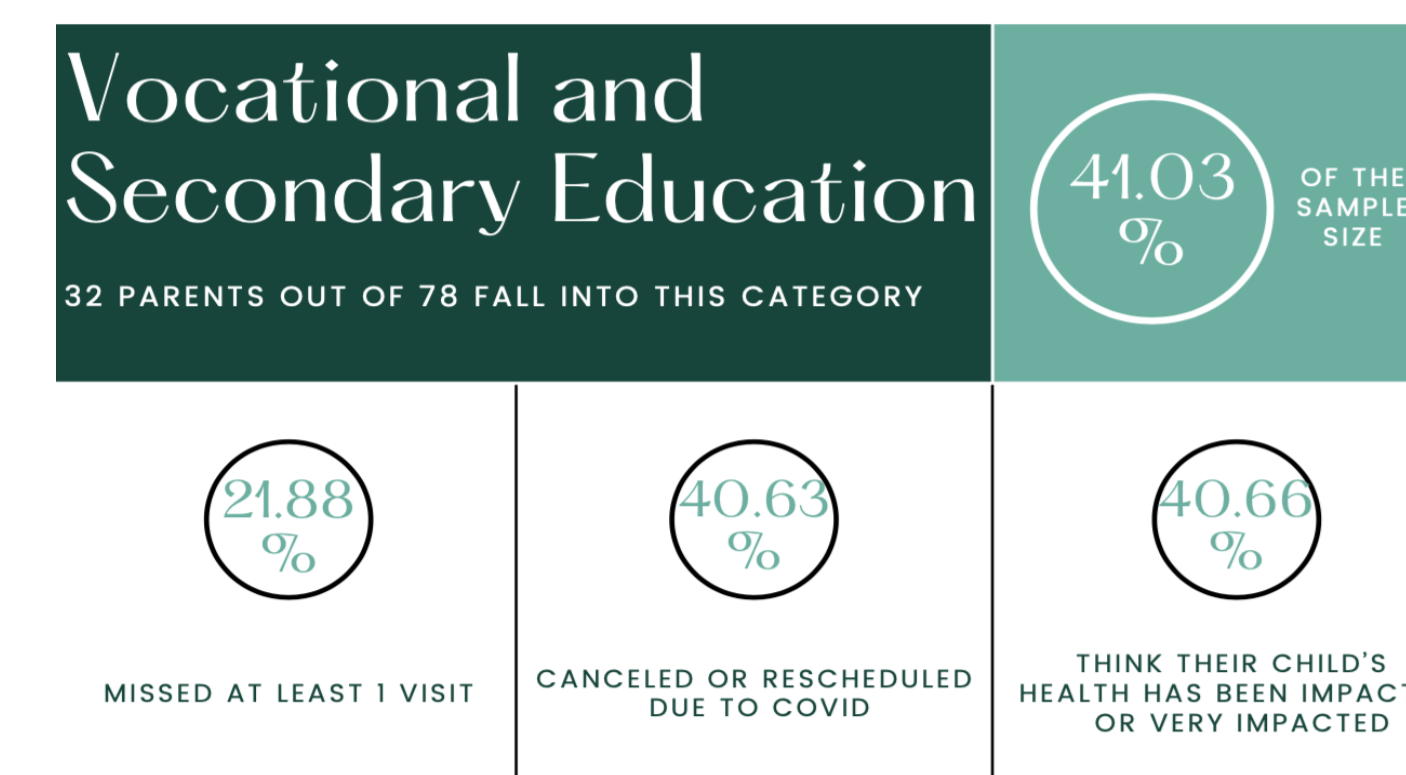


Figure 2. Percentage analysis for likelihood to bring child to receive COVID-19 vaccine

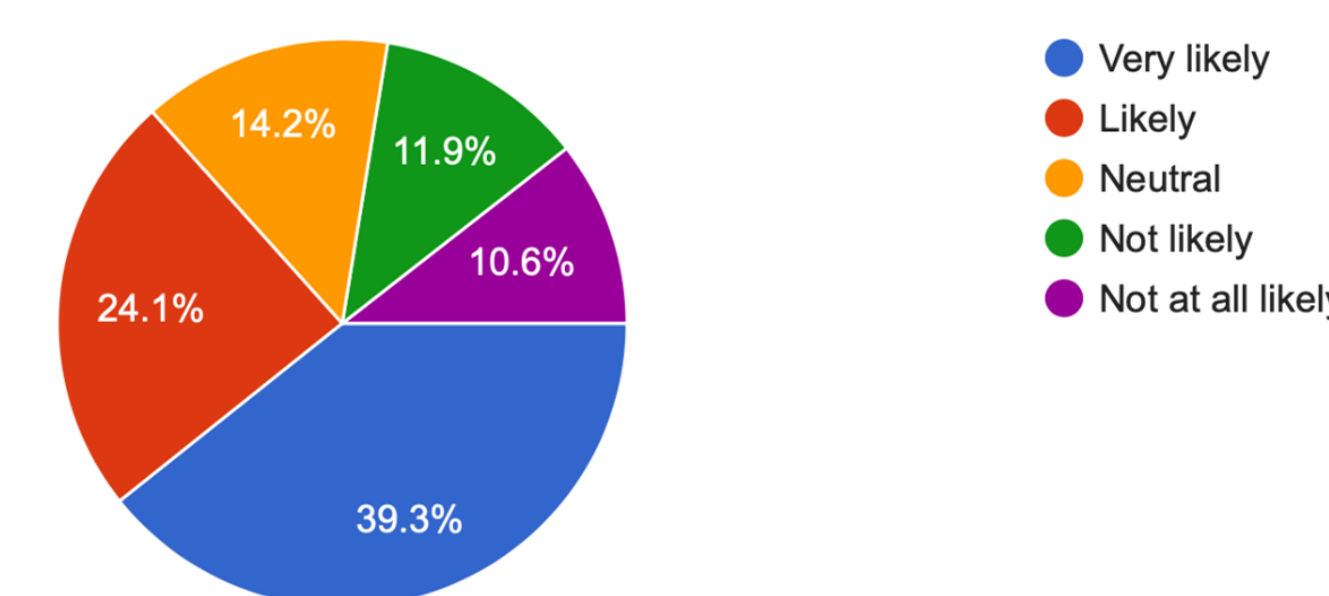
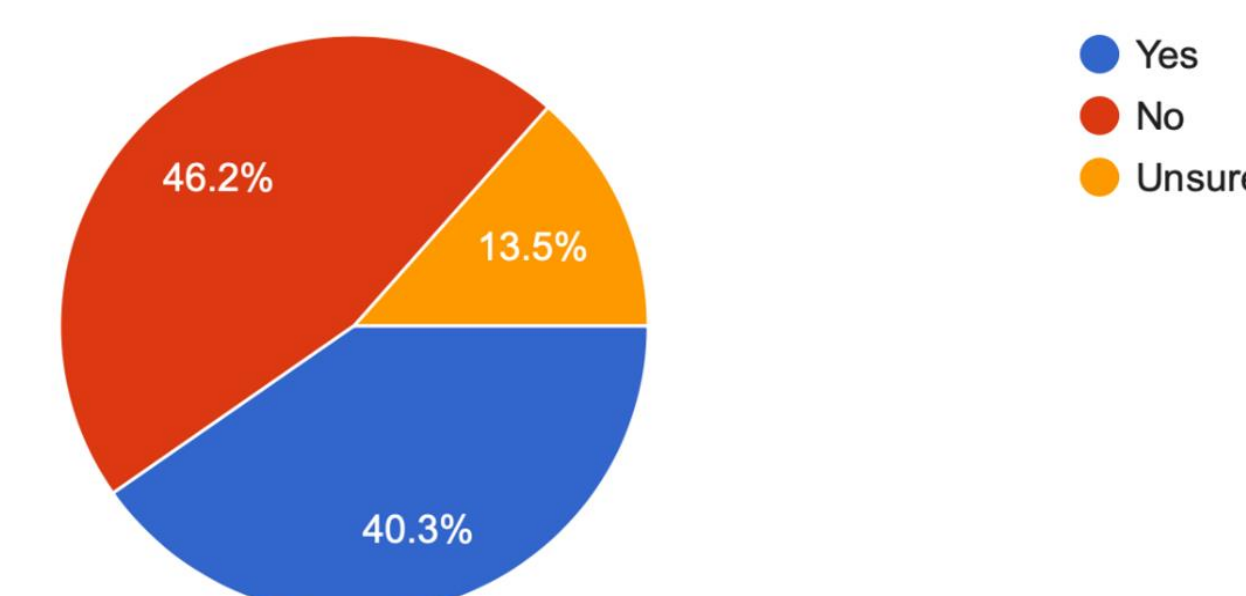


Figure 3. Percentage analysis for concerns with vaccine side effects and complications



CONCLUSION

Our data suggests that guardians of older children are more likely to cancel/miss an appointment. Overall about three quarters of guardians were uncomfortable with bringing their child into well-child checks. They were also not likely to reschedule with a telehealth appointment in lieu of an in-person visit. A little more than one third of guardians believed that their child was negatively impacted by the COVID-19 pandemic. The follow-up study data analysis suggests a decreased risk of severe illness from the COVID-19 virus, along with major concerns about COVID-19 vaccine complications, has negative correlation with compliance from guardians to bring their child to receive the COVID-19 vaccine. In addition, children who are up to date on all other immunizations are more likely to be brought in to receive the vaccine.

DISCUSSION

The goal of the study was to assess the attitudes and comfort of guardians to bring their children to well child checks and to receive the COVID-19 vaccine. Throughout the pandemic, there has been rapid public demand for accurate information that research has not been able to keep up with. This has resulted in mass panic and creation of misinformation that made it difficult for parents to make informed decisions. Parents weigh the risks and benefits each time they schedule in-person well-child checks for their children. Parents of younger children consider their susceptibility for contracting COVID-19 and other illnesses. Parental levels of anxiety due to the unknown nature and effect of COVID-19 vaccine may cause guardians to reconsider in-person visits.

It is important to realize the limitations of this study and the implications it has on the results and future directions. The major limitations were the limited number of participants that answered the survey questions, the small geographical location and the restriction to one healthcare system; two clinical affiliates of Michigan State University. A total of 78 completed surveys were obtained from the first study and 315 from the follow up study; a small number compared to the number of parents with children that are patients of the clinic. The number of surveys filled out can be attributed to the limited number of available appointments on any given day, the survey was only offered in English, and the survey was exclusively offered online or via QR code. The number of visits scheduled during any given hour has been reduced since the beginning of the COVID-19 pandemic, with sick visits being reduced even more significantly. The survey was offered via Google Form with QR code that were only posted in the main waiting areas. Paper copies were not offered because of sanitary precautions in relation to the COVID-19 pandemic.

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Jamie Alan, PHARM.D, PhD - Associate Professor, Pharmacology and Toxicology

Pulmonary Artery Catheterization in Persistent Left Superior Vena Cava

A Case Study

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BACKGROUND

- Pulmonary Artery Catheters (PAC) can assist in the diagnosis of problems such as shock, pulmonary embolisms, and heart failure.¹
- Venous access through PAC can serve as a conduit for administration of medications contraindicated in peripheral IV route.
- Typical access to the central venous system can be complicated by the vascular anomaly persistent left superior vena cava (PLSVC).
- This anomaly can complicate catheter placement through the left subclavian vein and left internal jugular vein.
- This case presentation offers the opportunity to observe PLSVC clearly demonstrated on a chest X-ray. The visual features are accompanied by a discussion of the embryological basis of this finding, the clinical implications of PLSVC, and suggestions on how to limit the risk of venous injury during difficult central venous catheterization

CASE REPORT

- 68-year-old man with acute-on-chronic CHF & reduced EF in ICU
- 1st attempt placing PAC through right internal jugular vein was unsuccessful, resulted in a neck hematoma.
- 2nd attempt through the left internal jugular vein came with difficulty advancing the wire beyond several centimeters, eventually successful in advancing PAC, was later removed.
- Several days later, patient required PAC for follow-up heart catheterization. Resulted in right internal jugular vein hematoma on 1st attempt.
- 2nd attempt through left internal jugular vein was possible with mild difficulty in advancing the wire. Ultimately an introducer was placed with a triple-lumen insertable catheter through the introducer. Catheter had good intravenous flow, central venous pressure monitoring from this catheter resulted in erratic values between 0 and 15 mmHg.
- Chest X-ray after placement demonstrated apparent extra anatomic location of the catheter tip. This imaging is indicative of persistent left superior vena cava.
- Chest CT and Transesophageal ECHO imaging were reviewed, there is no clear evidence of a left superior vena cava to coronary sinus connection. This suggests the anatomic variations present with a low-flow state.

KEY IMAGES

AP chest X-rays were taken after the appropriate placement of the PAC as seen in figures 1- 4 demonstrating the discovery of a PLSVC. Further review of CT and TEE images did not provide evidence of a left superior vena cava to coronary sinus connection. This suggests the anatomic variation exists with a low-flow state. No further anomalies were identified upon review of all three image types captured for this case.

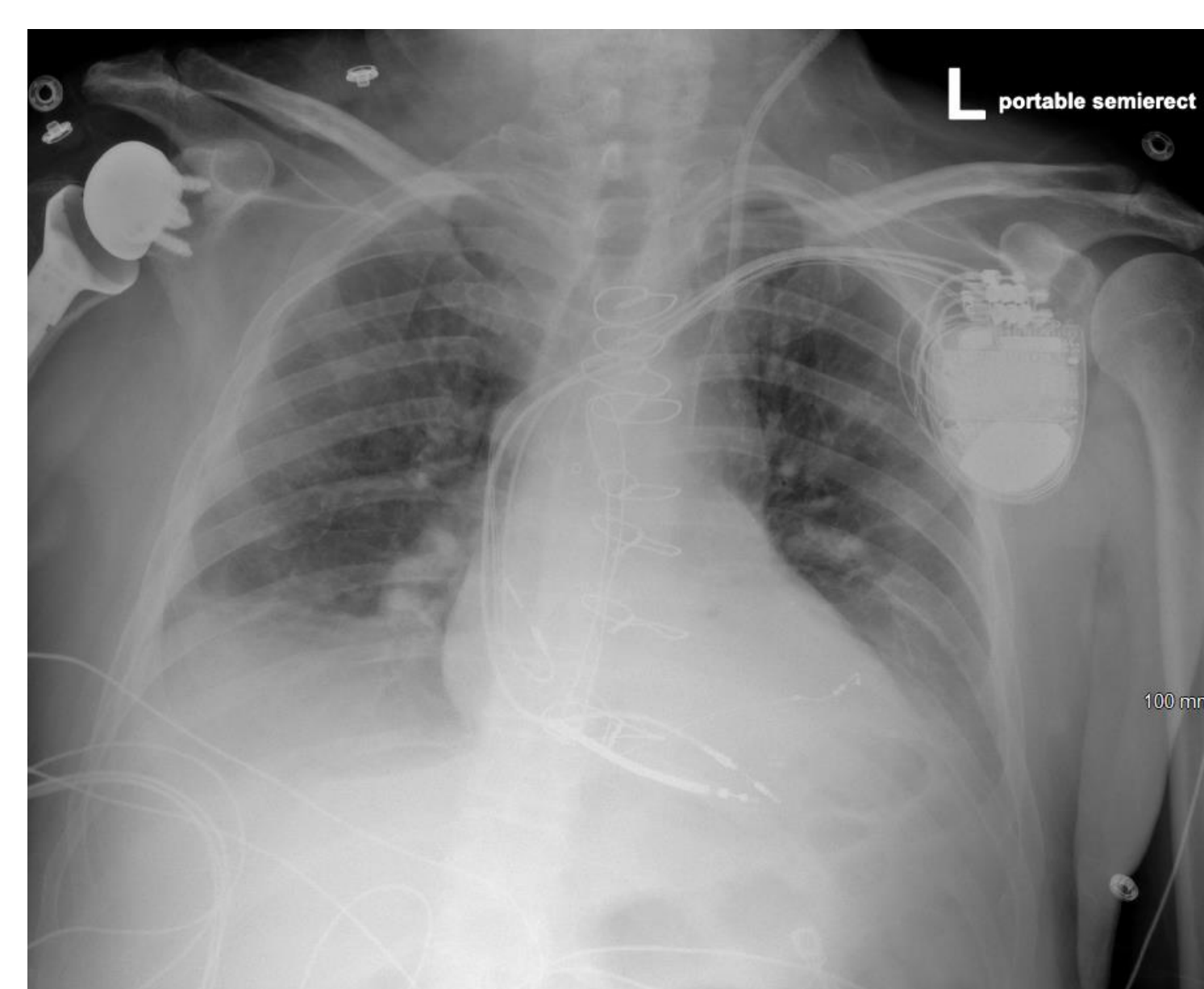


Figure 1: AP chest X-ray. Introducer and catheter in left internal jugular vein.

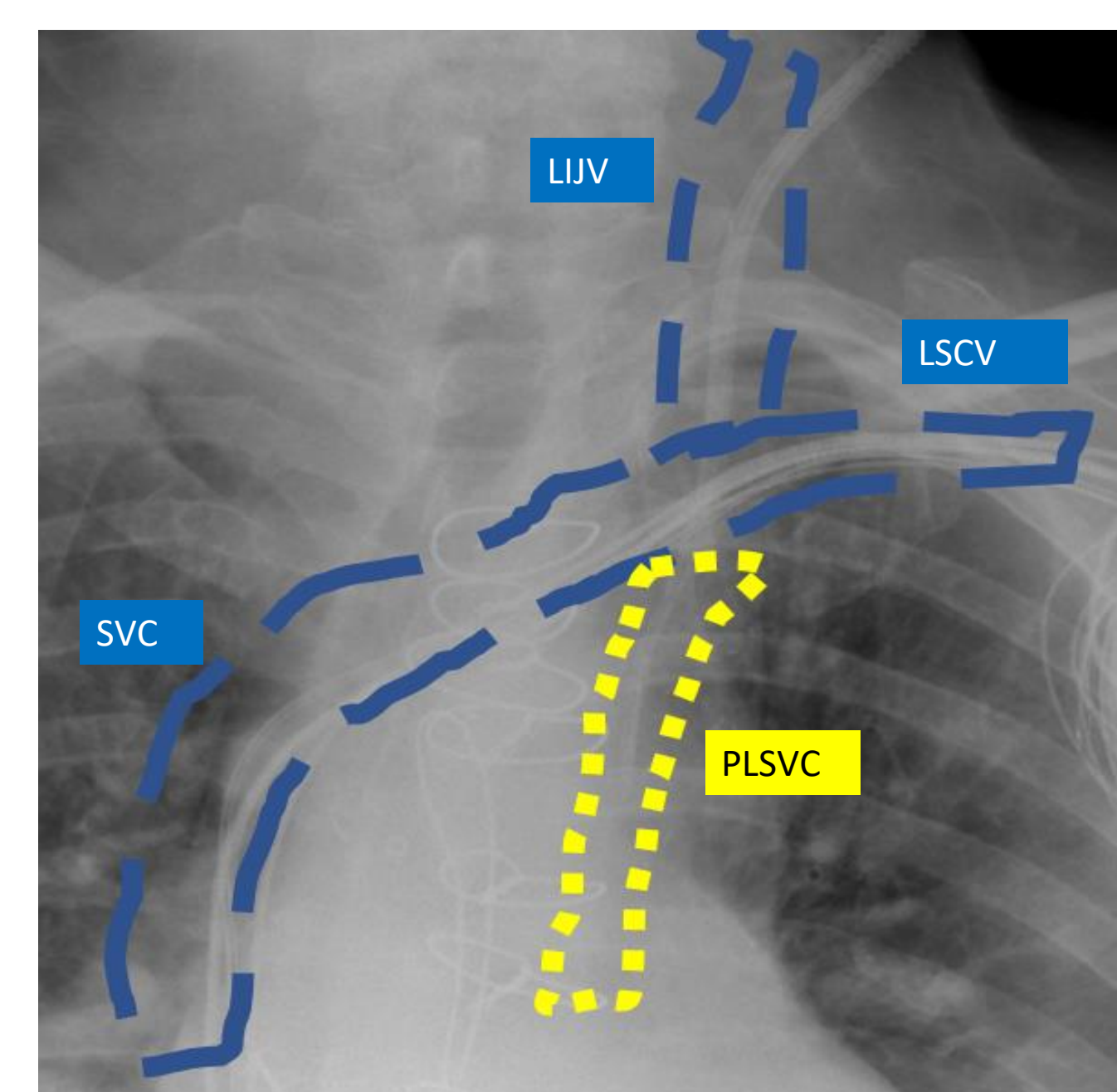


Figure 2: Zoomed-in on figure 1 to outline left internal jugular vein (LIJV), left subclavian vein (LSCV), superior vena cava (SVC), and persistent left superior vena cava with introducer and catheter in PLSVC.

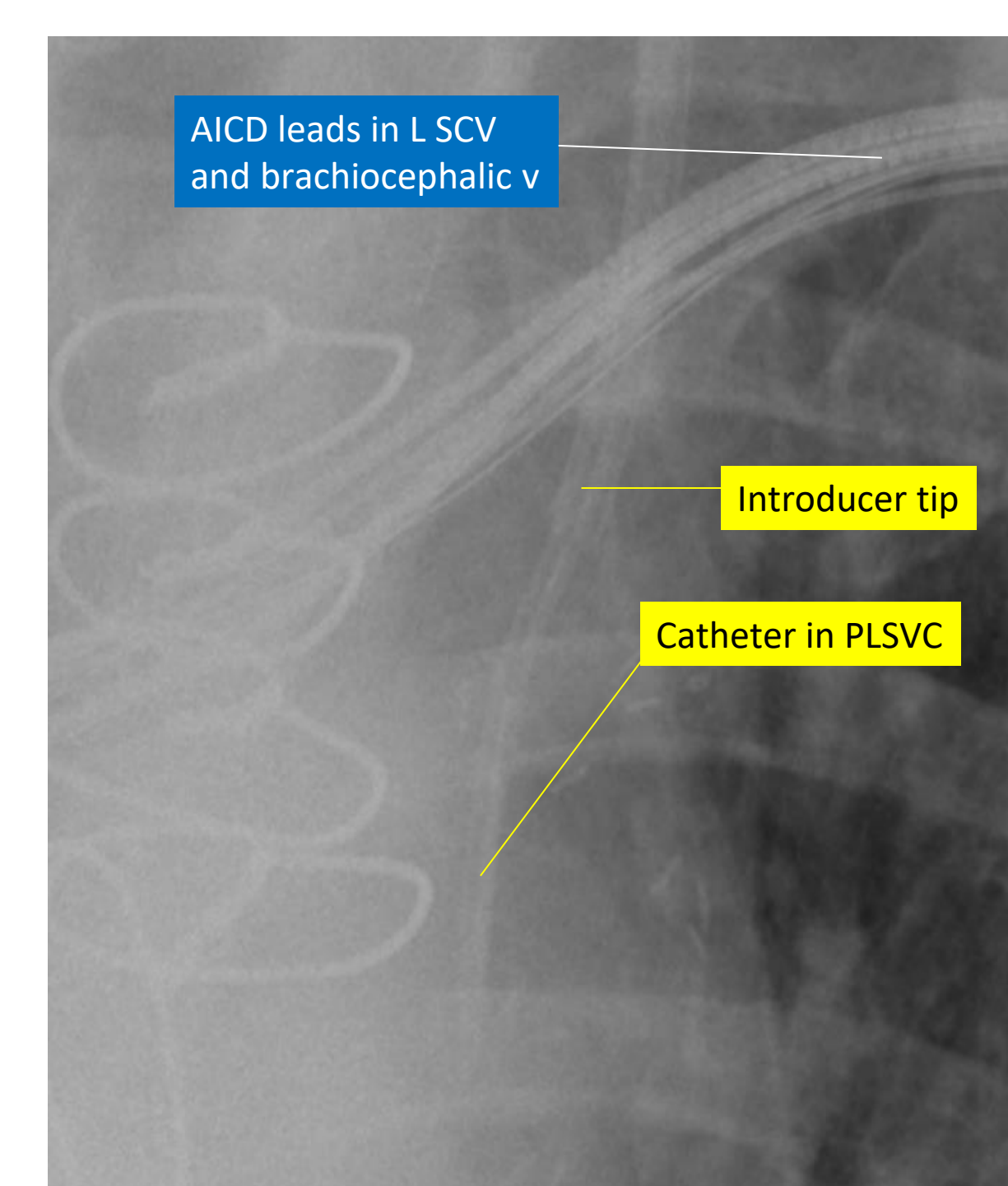


Figure 3: Zoom-in of figure 2 to better visualize catheter tip within PLSVC. AICD leads delineate the path of the LSCV indicating that vasculature inferior to this is extra-anatomic.

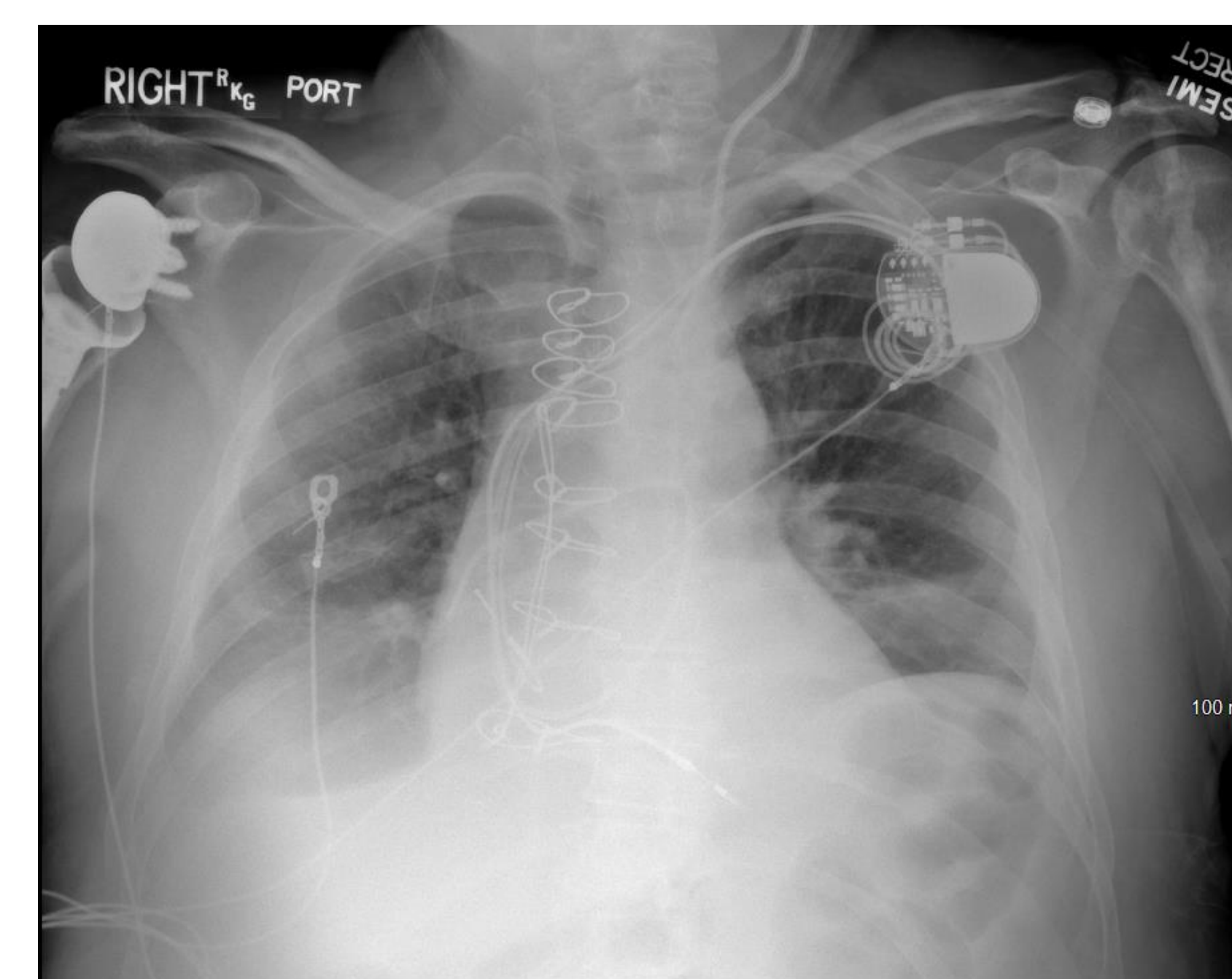


Figure 4: AP chest X-ray demonstrating LIJV-inserted PAC with PAC tip appropriate for hemodynamic measurements.

DISCUSSION

- PLSVC results from embryological vasculature failing to regress. The common and right cardinal veins form the SVC during prenatal development.^{2,3}
- Embryologically, the common cardinal vein (CV) and right CV form the right SVC. The left CV along with the caudal portion of the left superior CV will regress.
- Failure of regression will result in a PLSVC, and is illustrated in Figure 5 below.^{3,4}
- PLSVC are prevalent in 0.3 to 0.5% of the population. In individuals with CHF, the prevalence could reach 10%.⁴
- Reaching a definitive diagnosis requires determining the following: 1) origin site 2) drainage site 3) orientation of the route between origin and drainage sites in reference to mediastinal structures 4) expected direction of blood flow, and 5) characteristics of accompanying cardiac and non-cardiac diseases with the use of CTA.³
- Many articles ascertain a number of dangers and complications associated with central line placement within a PLSVC, one case series illustrates the possibility of safe use under specific conditions for the use of chemotherapy and hemodialysis. For most other situations it is advised to avoid going through the anatomical anomaly to avoid causing dysrhythmias, venous stenosis, coronary sinus thrombosis, cardiac tamponade and cardiac arrest just to name a few.⁵
- Special considerations should be taken with patients suspected to, or confirmed, to have PLSVC to avoid unintentional harm. Table 1 lists some of the common anomalies associated with PLSVC.

Cardiovascular anomalies associated with PLSVC

Atrial septal defects
Bicuspid aortic valve
Coarctation of the aorta
Coronary sinus ostial atresia
Cor Triatriatum
Architectural abnormalities of sinus node and tissues

Table 1: Common cardiovascular anomalies associated with PLSVC.⁴

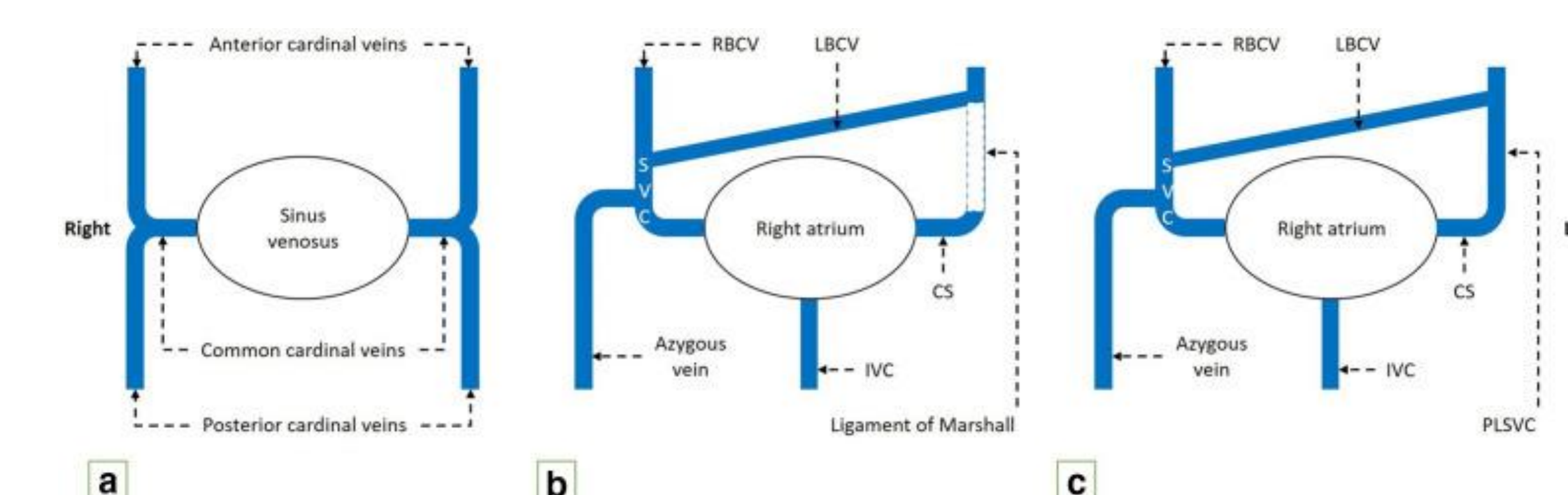


Figure 5A: The right and left posterior cardinal veins joining to form the right and left common cardinal veins.

Figure 5B: Right anterior cardinal vein and right cardinal vein forming the SVC. While the left anterior cardinal vein regresses and forms the ligament of Marshall

Figure 5C: Failure of regression of the left anterior cardinal vein results in the persistent left SVC.⁴

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Background

- Hospitalized patients spend days to weeks in a bed, experiencing minimal physical exercise
 - Patients are only mobile 10% of each day¹
- In-patient care is not without risk, relative immobilization contributes to hospital-associated illness and death²
- Hospitalized patients have an increased risk of developing²:
 - Pneumonia
 - De-conditioning
 - Deep Vein Thrombosis
 - Falls with Ambulation
- Elderly patients are particularly vulnerable to:³
 - Functional deterioration
 - Sarcopenia
 - Delirium
- Early and frequent ambulation is proven to decrease delirium and overall fall risk⁴⁻⁵
- Litigation fears, lowers reimbursement, and staffing limitations contributes to decreased patient ambulation, exacerbating riskfactors⁶
- Resistance training improves balance and flexibility⁷
- Seated workouts with rubber exercise bands increases upper body strength in older patients⁸
- **Focus Question:**
 - 1) *If hospitalized patients are provided with a rubber exercise band and an instructional card, will they engage in self-paced exercises during their hospital stay?*

Methods

- This study is a quality improvement survey
- Eligible participants will be enrolled at the onset of their admission based upon pre-existing criteria
- Upon enrollment, participants will be evaluated on their physical strength via a standardized exercise
- Participants will be provided with:
 - One of three rubber straps of suitable resistance
 - An instructional exercise card showcasing upper and lower body exercises
- Upon discharge, participants will be provided with a written survey to comment on their self-paced, in-bed exercises and experience

Results

- No data has been collected to date
- Anticipated start of collection is the Fall of 2023
- This is a quality improvement study that aims to ascertain whether participants engage in self-paced, in-bed exercises, as well as:
 - Overall compliance
 - Frequency of exercising
 - Barriers to exercising
 - Impact on overall hospital stay
- This survey may lay the groundwork for future experiments evaluating the impact that self-paced, in-bed workouts have on hospital-associated:
 - Pneumonia
 - De-conditioning
 - Deep Vein Thrombosis
 - Falls with Ambulation
 - Delirium

Conclusions

- No data has been collected to date
- Based upon encouraging Japanese and European experiments, it is theorized that rubber exercise straps could similarly:⁸⁻⁹
 - Increase upper body strength
 - Improve cognition
 - increase functional independence
- In addition to slowing or preventing both physical and mental decline, it is anticipated that self-paced, in-room exercises may prove to:
 - Reduce bed alarm alerts
 - Extend physical therapy treatment goals
 - Reduce hospital-associated delirium and agitation
 - Lead to an improved overall hospital experience

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Understanding gaps in diabetic eye care in a primary care setting



Indhu Rammohan, MS1

INTRODUCTION

Eleven percent of the US population (37.3 million) is currently living with diabetes,¹ with 30% of those above the age of 40 at risk of vision impairment due to diabetic retinopathy.²

It is recommended that:

- Adults with type 2 diabetes have their first dilated eye exam when initially diagnosed^{3,4}
- People with type 1 diabetes have their first eye exam within 5 years of diagnosis^{3,4}
- After that, all people with diabetes should have an annual eye exam³

Given that diabetic retinopathy is the most common cause of new blindness among adults in high-income countries,⁴ comprehensive screening, prevention, treatment efforts are of critical importance

This investigation aims to answer the question: what gaps in diabetic eye exam health maintenance exist at a Corewell Health West Integrated Care Campus (CHW ICC).

CLINICAL CONTEXT

Diabetic eye exam rates at this CHW ICC are reflective of a nationwide gap in preventative care among a critical patient population that is steadily growing.⁵ Diabetic patients are typically referred to external ophthalmological practices and exam results are communicated to the primary care provider. If a patient has self-referred or has an existing eye care specialist, the clinic requests the records with authorization from the patient.

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HIGHLIGHTS

- Diabetic eye exams account for **one third of overdue care gaps** in the clinic
- Gaps in diabetic eye care are **multi-factorial**
- Majority of patients overdue for an exam did not have an active referral
- Of the minority who have received recent referrals, most did not schedule an appointment after being contacted by the ophthalmologist's office
- Suboptimal communication/coordination between diabetes care providers is likely contributing to gaps in care
- Diabetic retinopathy screening may be deprioritized by patients with multiple chronic health conditions

METHODS

A 'Patients with Overdue Care Gaps' report was generated in Epic based on presence of any health maintenance flags since February 1, 2023 and filtered to include only patients of Rockford ICC providers who were ≥18 year of age. Patients were excluded if currently pregnant, diagnosed with complete blindness, or had secondary diabetes (i.e., gestational, steroid-induced). Chart review was conducted for patients with a 'Diabetic Retinal Eye Exam' health maintenance flag to obtain the following variables:

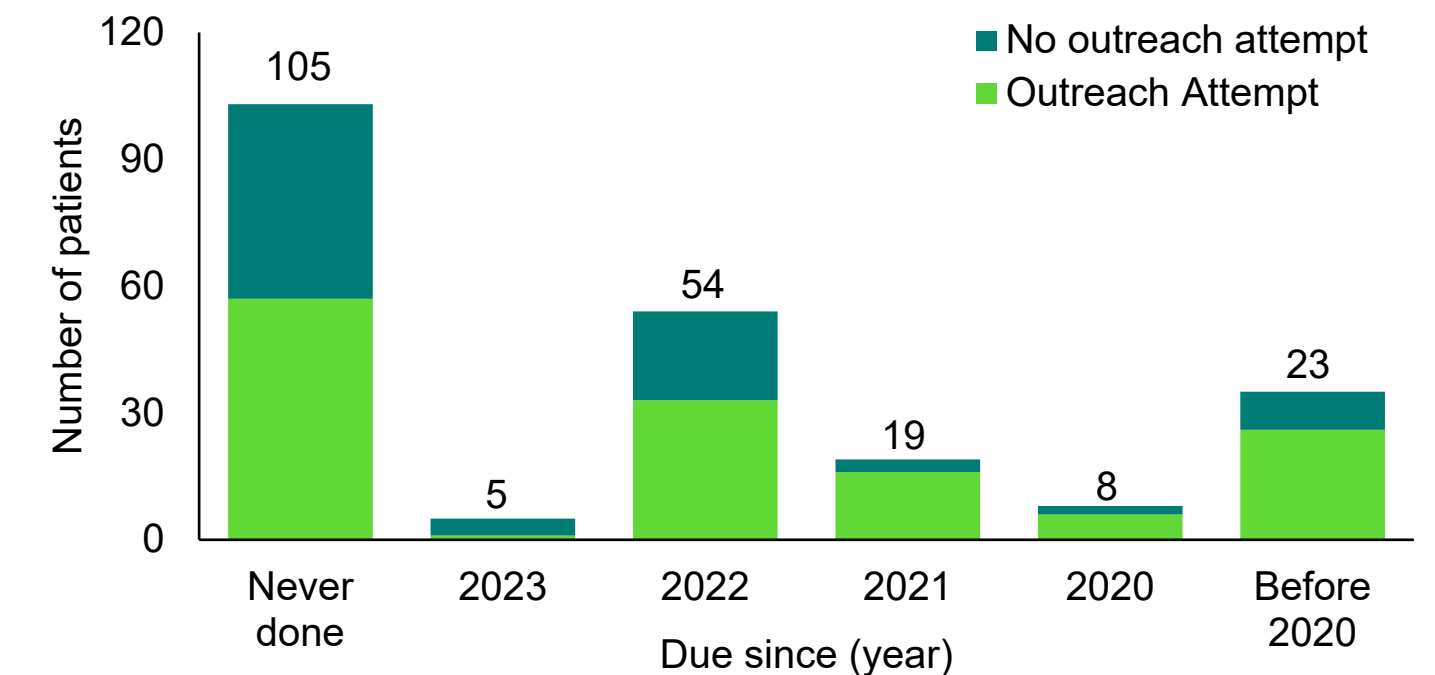
- Age
- Gender
- Overdue since (date)
- Diabetic Gaps in Care outreach attempt (Y/N)
- Method of outreach attempt (e.g., portal message, telephone, mail)
- Eye exam ordered in past year (Y/N)
- In-person or virtual visit at Rockford ICC in past year (Y/N)

FINDINGS

As of February 1, 2023:

- 224 patients identified as overdue for diabetic eye exam
- 214 patients truly overdue for diabetic eye exam = 32% of overdue care gaps
- Median age = 62 (IQR: 73–48); 57% male
- 75% (n=161) had in-person/virtual visit in past year
- 62% (n=133) had at least 1 Gaps in Care Outreach attempt since overdue
- Most frequent method of outreach was patient portal message
- No significant gendered differences in "overdue since" dates (p=0.08)

"Overdue since" dates by attempted outreach



- <1% (n=9) patients had been referred to an ophthalmologist for a diabetic eye exam in the past year—of these, 67% (n=6) had their referral closed due to lack of response to scheduling requests
- Within the total sample, <1% (n=14) had been referred since being overdue but failed to respond to scheduling requests
- 6 patients reportedly had eye exams in 2021-2022, though results have not been communicated by the ophthalmology practice

DISCUSSION

Gaps in diabetic eye care are multifactorial. Adequate health maintenance is dependent on coordination of care between providers, as well as patient knowledge and self-efficacy.⁶ Overdue patients also often had several health maintenance flags related to diabetes or chronic conditions. Patient outreach for health maintenance gaps list overdue items in a way that may overwhelm a patient with multiple health concerns or lead to deprioritization of that gap in care. Prior research has shown that targeted education about diabetic retinopathy can be effective in empowering patients to be more proactive in their diabetes care.⁶ This approach, perhaps combined with tiered health maintenance flags (e.g., high priority vs. low priority) may improve eye exam rates in primary care settings.

Communication gaps between diabetes care providers (endocrinologist, primary care physician, ophthalmologist) can also lead to fragmented care,⁶ which was noted in the present study. Establishing clear roles within a care team and creating standardized reporting forms may further improve diabetic retinopathy screening practices.