2023 MSTAR

MSTAR

MEDICAL STUDENT TRAINING IN AGING RESEARCH

at ICAHN SCHOOL OF MEDICINE at MOUNT SINAI

ABSTRACTS and POSTERS

BOOK

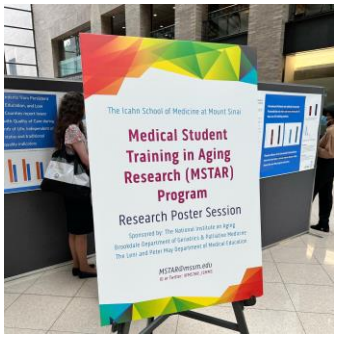
The Medical Student Training in Aging Research (MSTAR) Program is sponsored by:

The National Institute for Aging (NIA)

The Brookdale Department of Geriatrics & Palliative Medicine

The Leni and Peter W. May Department of Medical Education

Icahn School of Medicine at Mount Sinai



MSTAR

The **Medical Student Training in Aging Research (MSTAR) Program at The Icahn School of Medicine at Mount Sinai** is a T-32 program, generously funded by The National Institute on Aging (NIA). It proudly stands as one of the eight National Training Centers, an impressive group that includes Harvard Medical School, Johns Hopkins University School of Medicine, NYU, UCLA, UC San Diego, University of North Carolina, and Augusta University (Puerto Rico).

MSTAR is an intensive eight-week immersion into aging and palliative care research. Under the guidance of leading experts, students delve into a wide range of scientific investigations, encompassing basic sciences, clinical research, and health services studies.

The MSTAR program uniquely positions students early in their medical training to acquire hands-on experience and insights often only accessible in the later phases of academic training. The program offers an in-depth exploration of research methodologies, platforms for research presentations and opportunities for publications, real-world clinical geriatrics and palliative medicine exposure, comprehensive information on various medical career paths, and opportunities to network with peers and mentors.

Alumni of the MSTAR Program at ISMMS have carved out successful careers in diverse areas, contributing to the expanding pool of dedicated scientists, innovative thinkers, and adept physicians. Regardless of their specific field, MSTAR alumni are applying the fundamental principles of aging and palliative care, a foundation built during their time in the program, with escalating significance. This expertise is increasingly vital to meet the demands of our rapidly aging society.

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2023 MSTAR Program at ISMMS Scholars

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Project: A Retrospective Review of Pharmacogenomic Impact on Stroke Outcomes

Mentor: Christopher Kellner, MD

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Project: Racial/Ethnic Disparities in Potentially Inappropriate Medication (PIM) Use in Patients with Dementia

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Project: Treatment Tolerability and Outcomes in Older Adults with Oropharyngeal Squamous Cell Carcinoma

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Project: Comparative Analysis of Geriatric Surgical Outcomes Between Anterior and Posterior Cervical Fusion: A 30-Year Study Using the National Inpatient Sample Database

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Project: Regeneration and Immune Cell Involvement in a Mouse Intervertebral Disc Puncture Injury Model

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Project: Social Navigation in Aging: Understanding Distancing Behavior in an Online Social Navigation Task

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Project: Qualitative Perspectives of Early Palliative Care Coordination for Women of Color Living with Advanced Breast Cancer

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Project: Identifying Veterans at Risk of Poor Care Transitions: Primary Care Follow Up After Non-VA ED Use

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Yash Lahoti
Icahn School of Medicine at Mount Sinai

Project: Development of a Deep Learning Algorithm to Automate the Segmentation of Spinal Cord from EOS Radiographic Images

Mentor: Jun Kim, MD

Amare Osei
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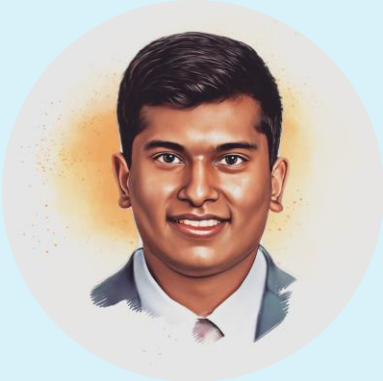
Project: Associations Between Cognitive Ability and Changes in Quality of Life Among Older Adults with Metastatic Cancer Undergoing Palliative Radiation Therapy

Mentor: Kavita Dharmarajan, MD



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Project: The Impact of Frailty on Facial Nerve Recovery Following Bell's Palsy

Mentor: Mingyang Gray MD, MPH

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Project: Association Between Primary Spoken Language and Hospital Readmissions Following Hip Fracture Diagnosis: A Retrospective Cohort Study

Mentor: Jashvant Poeran, MD, PhD

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Project: Racial Disparities In The Emergency Department Among Patients With Life-limiting Illnesses

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Project: Impact of Extreme Heat Exposure in Pregnancy on Maternal Health Outcomes

Mentor: Perry Sheffield, MD

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Icahn School of Medicine at Mount Sinai

Project: Comparing Frailty Indices in Surgical Outcomes of Transsphenoidal Pituitary Adenomas

Mentor: Raj Shrivastava, MD

Jacqueline Slobin
Icahn School of Medicine at Mount Sinai

Project: Quantifying Changes In Vascular Oxidative Stress in the Microenvironment of Vulnerable Neurons Over the Course of Alzheimer's Disease Progression

Mentor: Patrick R. Hof, MD PhD

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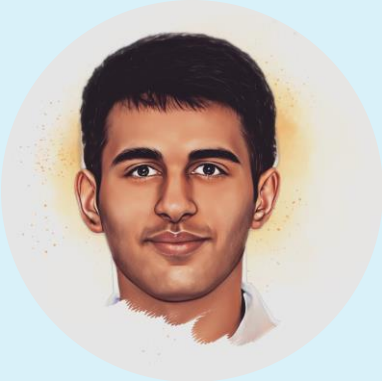

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Georgetown University School of Medicine

Project: The Mitochondrial Unfolded Protein Response Predicts the Immune Landscape During Melanomagenesis

Mentor: Jerry Chipuk, PhD

Devarshi Vasa
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Project: Predictors of Length of Stay and 30-day Mortality in the Medical Management of Elderly Patients with Intracerebral Hemorrhage

Mentor: Christopher Kellner, MD

Anya Wang
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Project: The Impact Of Topical Oxygen Therapy On Wound Healing: Assessing Efficacy And The Influence Of Patient Characteristics In A Single-institution Retrospective Chart Review

Mentor: Harvey Himel, MD

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Abstracts and Posters

A Retrospective Review of Pharmacogenomic Impact on Stroke Outcomes

Maximilian Bazil BS, Rajiv Nadukuru MS, Aniwaa Owusu-Obeng PharmD, Christopher Kellner MD
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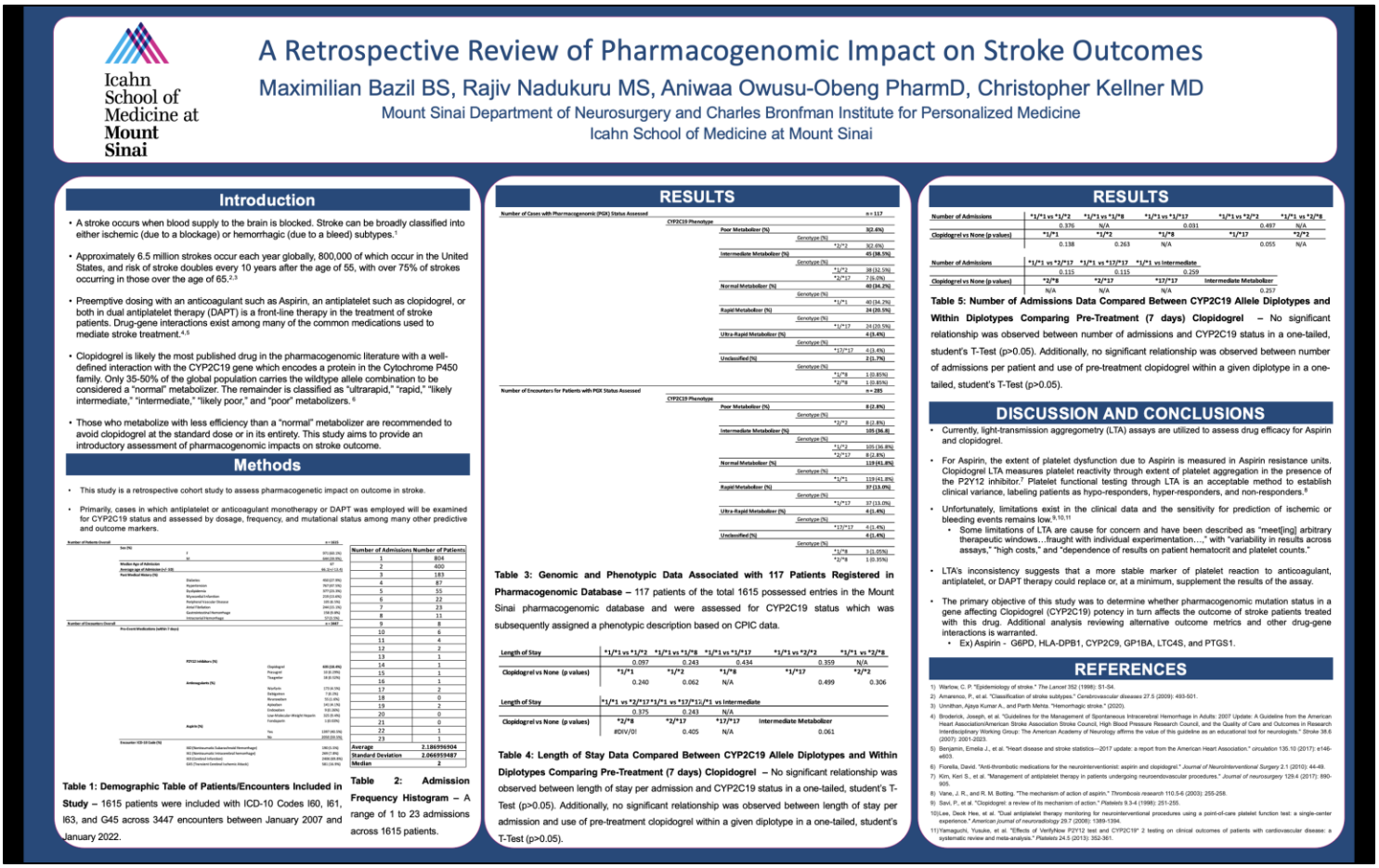

A Retrospective Review of Pharmacogenomic Impact on Stroke Outcomes

Maximilian Bazil BS, Rajiv Nadukuru MS, Aniwaa Owusu-Obeng PharmD, Christopher Kellner MD

Mount Sinai Department of Neurosurgery and Charles Bronfman Institute for Personalized Medicine

Icahn School of Medicine at Mount Sinai

Introduction

- A stroke occurs when blood supply to the brain is blocked. Stroke can be broadly classified into either ischemic (due to a blockage) or hemorrhagic (due to a bleed) subtypes.[1]
- Approximately 6.5 million strokes occur each year globally, 800,000 of which occur in the United States, and risk of stroke doubles every 10 years after the age of 55, with over 75% of strokes occurring in those over the age of 65.[2,3]
- Preemptive dosing with an anticoagulant such as Aspirin, an antiplatelet such as clopidogrel, or both in dual antiplatelet therapy (DAPT) is a front-line therapy in the treatment of stroke patients. Drug-gene interactions exist among many of the common medications used to mediate stroke treatment.[4,5]
- Clopidogrel is likely the most published drug in the pharmacogenomic literature with a well-defined interaction with the CYP2C19 gene which encodes a protein in the Cytochrome P450 family. Only 35-50% of the global population carries the wildtype allele combination to be considered a "normal" metabolizer. The remainder is classified as "ultrarapid," "rapid," "likely intermediate," "intermediate," "likely poor," and "poor" metabolizers.[6]
- Those who metabolize with less efficiency than a "normal" metabolizer are recommended to avoid clopidogrel at the standard dose or in its entirety. This study aims to provide an introductory assessment of pharmacogenomic impacts on stroke outcome.

Methods

- This study is a retrospective cohort study to assess pharmacogenetic impact on outcome in stroke.
- Primarily, cases in which antiplatelet or anticoagulant monotherapy or DAPT was employed will be examined for CYP2C19 status and assessed by dosage, frequency, and mutational status among many other predictive and outcome markers.

Number of Admissions	Number of Patients
1	814
2	400
3	183
4	87
5	55
6	22
7	23
8	11
9	8
10	6
11	4
12	2
13	1
14	1
15	1
16	1
17	2
18	0
19	2
20	0
21	0
22	1
23	1
Average	2.186956904
Standard Deviation	2.066959487
Median	2

Table 1: Demographic Table of Patients/Encounters Included in Study – 1615 patients were included with ICD-10 Codes I60, I61, I63, and G45 across 3447 encounters between January 2007 and January 2022.

Table 2: Admission Frequency Histogram – A range of 1 to 23 admissions across 1615 patients.

RESULTS

Number of Cases with Pharmacogenomic (PGX) Status Assessed			n = 117
CYP2C19 Phenotype			
	Poor Metabolizer (%)		3(2.6%)
		Genotype (%)	
		*2/*2	3(2.6%)
	Intermediate Metabolizer (%)		45 (38.5%)
		Genotype (%)	
		*1/*2	38 (32.5%)
		*2/*17	7 (6.0%)
	Normal Metabolizer (%)		40 (34.2%)
		Genotype (%)	
		*1/*1	40 (34.2%)
	Rapid Metabolizer (%)		24 (20.5%)
		Genotype (%)	
		*1/*17	24 (20.5%)
	Ultra-Rapid Metabolizer (%)		4 (3.4%)
		Genotype (%)	
		*17/*17	4 (3.4%)
	Unclassified (%)		2 (1.7%)
		Genotype (%)	
		*1/*8	1 (0.85%)
		*2/*8	1 (0.85%)
Number of Encounters for Patients with PGX Status Assessed			n = 285
CYP2C19 Phenotype			
	Poor Metabolizer (%)		8 (2.8%)
		Genotype (%)	
		*2/*2	8 (2.8%)
	Intermediate Metabolizer (%)		105 (36.8)
		Genotype (%)	
		*1/*2	105 (36.8%)
		*2/*17	8 (2.8%)
	Normal Metabolizer (%)		119 (41.8%)
		Genotype (%)	
		*1/*1	119 (41.8%)
	Rapid Metabolizer (%)		37 (13.0%)
		Genotype (%)	
		*1/*17	37 (13.0%)
	Ultra-Rapid Metabolizer (%)		4 (1.4%)
		Genotype (%)	
		*17/*17	4 (1.4%)
	Unclassified (%)		4 (1.4%)
		Genotype (%)	
		*1/*8	3 (1.05%)
		*2/*8	1 (0.35%)

Table 3: Genomic and Phenotypic Data Associated with 117 Patients Registered in Pharmacogenomic Database – 117 patients of the total 1615 possessed entries in the Mount Sinai pharmacogenomic database and were assessed for CYP2C19 status which was subsequently assigned a phenotypic description based on CPIC data.

Length of Stay	*1/*1 vs *1/*2	*1/*1 vs *1/*8	*1/*1 vs *1/*17	*1/*1 vs *2/*2	*1/*1 vs *2/*8
	0.097	0.243	0.434	0.359	N/A
Clopidogrel vs None (p values)	*1/*1	*1/*2	*1/*8	*1/*17	*2/*2
	0.240	0.062	N/A	0.499	0.306

Length of Stay	*1/*1 vs *2/*17	*1/*1 vs *17/*17	*1/*1 vs Intermediate
	0.375	0.243	N/A
Clopidogrel vs None (p values)	*2/*8	*2/*17	*17/*17 Intermediate Metabolizer
	#DIV/0!	0.405	N/A 0.061

Table 4: Length of Stay Data Compared Between CYP2C19 Allele Diplotypes and Within Diplotypes Comparing Pre-Treatment (7 days) Clopidogrel – No significant relationship was observed between length of stay per admission and CYP2C19 status in a one-tailed, student's T-Test (p>0.05). Additionally, no significant relationship was observed between length of stay per admission and use of pre-treatment clopidogrel within a given diplotype in a one-tailed, student's T-Test (p>0.05).

RESULTS

Number of Admissions	*1/*1 vs *1/*2	*1/*1 vs *1/*8	*1/*1 vs *1/*17	*1/*1 vs *2/*2	*1/*1 vs *2/*8
	0.376	N/A	0.031	0.497	N/A
Clopidogrel vs None (p values)	*1/*1	*1/*2	*1/*8	*1/*17	*2/*2
	0.138	0.263	N/A	0.055	N/A

Number of Admissions	*1/*1 vs *2/*17	*1/*1 vs *17/*17	*1/*1 vs Intermediate	
	0.115	0.115	0.259	
Clopidogrel vs None (p values)	*2/*8	*2/*17	*17/*17	Intermediate Metabolizer
	N/A	N/A	N/A	0.257

Table 5: Number of Admissions Data Compared Between CYP2C19 Allele Diplotypes and Within Diplotypes Comparing Pre-Treatment (7 days) Clopidogrel – No significant relationship was observed between number of admissions and CYP2C19 status in a one-tailed, student's T-Test (p>0.05). Additionally, no significant relationship was observed between number of admissions per patient and use of pre-treatment clopidogrel within a given diplotype in a one-tailed, student's T-Test (p>0.05).

DISCUSSION AND CONCLUSIONS

- Currently, light-transmission aggregometry (LTA) assays are utilized to assess drug efficacy for Aspirin and clopidogrel.
- For Aspirin, the extent of platelet dysfunction due to Aspirin is measured in Aspirin resistance units. Clopidogrel LTA measures platelet reactivity through extent of platelet aggregation in the presence of the P2Y12 inhibitor.[7] Platelet functional testing through LTA is an acceptable method to establish clinical variance, labeling patients as hypo-responders, hyper-responders, and non-responders.[8]
- Unfortunately, limitations exist in the clinical data and the sensitivity for prediction of ischemic or bleeding events remains low.[9,10,11]
  - Some limitations of LTA are cause for concern and have been described as "meet[ing] arbitrary therapeutic windows…fraught with individual experimentation…," with "variability in results across assays," "high costs," and "dependence of results on patient hematocrit and platelet counts."
- LTA's inconsistency suggests that a more stable marker of platelet reaction to anticoagulant, antiplatelet, or DAPT therapy could replace or, at a minimum, supplement the results of the assay.
- The primary objective of this study was to determine whether pharmacogenomic mutation status in a gene affecting Clopidogrel (CYP2C19) potency in turn affects the outcome of stroke patients treated with this drug. Additional analysis reviewing alternative outcome metrics and other drug-gene interactions is warranted.
  - Ex) Aspirin - G6PD, HLA-DPB1, CYP2C9, GP1BA, LTC4S, and PTGS1.

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A RETROSPECTIVE REVIEW OF PHARMACOGENOMIC IMPACT ON STROKE OUTCOMES

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Introduction: A stroke occurs when blood supply to the brain is blocked. Stroke can be broadly classified into either ischemic (due to a blockage) or hemorrhagic (due to a bleed) subtypes.[1] Approximately 6.5 million strokes occur each year globally, 800,000 of which occur in the United States, and risk of stroke doubles every 10 years after the age of 55, with over 75% of strokes occurring in those over the age of 65.[5,6] Preemptive dosing with an anticoagulant such as Aspirin, an antiplatelet such as clopidogrel, or both in dual antiplatelet therapy (DAPT) is a front-line therapy in the treatment of stroke patients. Drug-gene interactions exist among many of the common medications used to mediate stroke treatment. Clopidogrel is likely the most published drug in the pharmacogenomic literature with a well-defined interaction with the CYP2C19 gene which encodes a protein in the Cytochrome P450 family. Only 35-50% of the global population carries the wildtype allele combination to be considered a "normal" metabolizer. The remainder is classified into groups such as "ultrarapid," "rapid," "likely intermediate," "intermediate," "likely poor," and "poor" metabolizers. Those who metabolize with less efficiency than a "normal" metabolizer are recommended to avoid clopidogrel at the standard dose or in its entirety. This study aims to provide an introductory assessment of pharmacogenomic impacts on stroke outcome.

Methods: This was a retrospective cohort study to assess pharmacogenetic impact on outcome in stroke. Relevant ICD-10 codes (I60 (Nontraumatic Subarachnoid Hemorrhage), I61 (Nontraumatic Intracerebral hemorrhage), I63 (Cerebral Infarction), I64 (Stroke), and G45 (Transient Cerebral Ischemic Attack) were used to pull patient data from our institution's pharmacogenomic registry and our neurosurgical patient database. Primarily, cases in which antiplatelet or anticoagulant monotherapy or DAPT was employed were examined for CYP2C19 status and assessed by dosage, frequency, and mutational status among other relevant predictive and outcome markers.

Results: 1615 patients were included with ICD-10 Codes I60 (n=190, 5.5%), I61 (n=269, 7.8%), I63 (n=2406, 69.8%), and G45 (n=581, 16.9%) across 3447 encounters between January 2007 and January 2022. The median age of admission was 67 years old (Average - 66.1+/-13.1) and females (n=971, 60.1%) were more represented than males (n=644, 39.9%) in the cohort. CYP2C19 phenotypes included poor metabolizers (diplotype *2/*2, n=3, 2.6%), intermediate metabolizers (diplotypes *1/*2, n=38, 32.5%, and *2/*17, n=7, 6.0%), normal metabolizers (diplotype *1/*1, n=40, 34.2%), rapid metabolizers (diplotype *1/*17, n=24, 20.5%), ultra-rapid metabolizers (diplotype *17/*17, n=4, 3.4%), and unclassified genotypes (diplotypes *1/*8, n=1, 0.85%, and *2/*8, n=1, 0.85%). No significant association was found between any phenotypes/diplotypes for either length of stay or number of admissions.

Conclusion: This study was a retrospective review of pharmacogenomic status in the stroke population in one of the highest volume stroke centers in the country. Additional study is warranted for outcome metrics such as treatment strategy, peri-treatment complications, bleeding even

Racial/Ethnic Disparities in Potentially Inappropriate Medication (PIM) Use in Patients with Dementia

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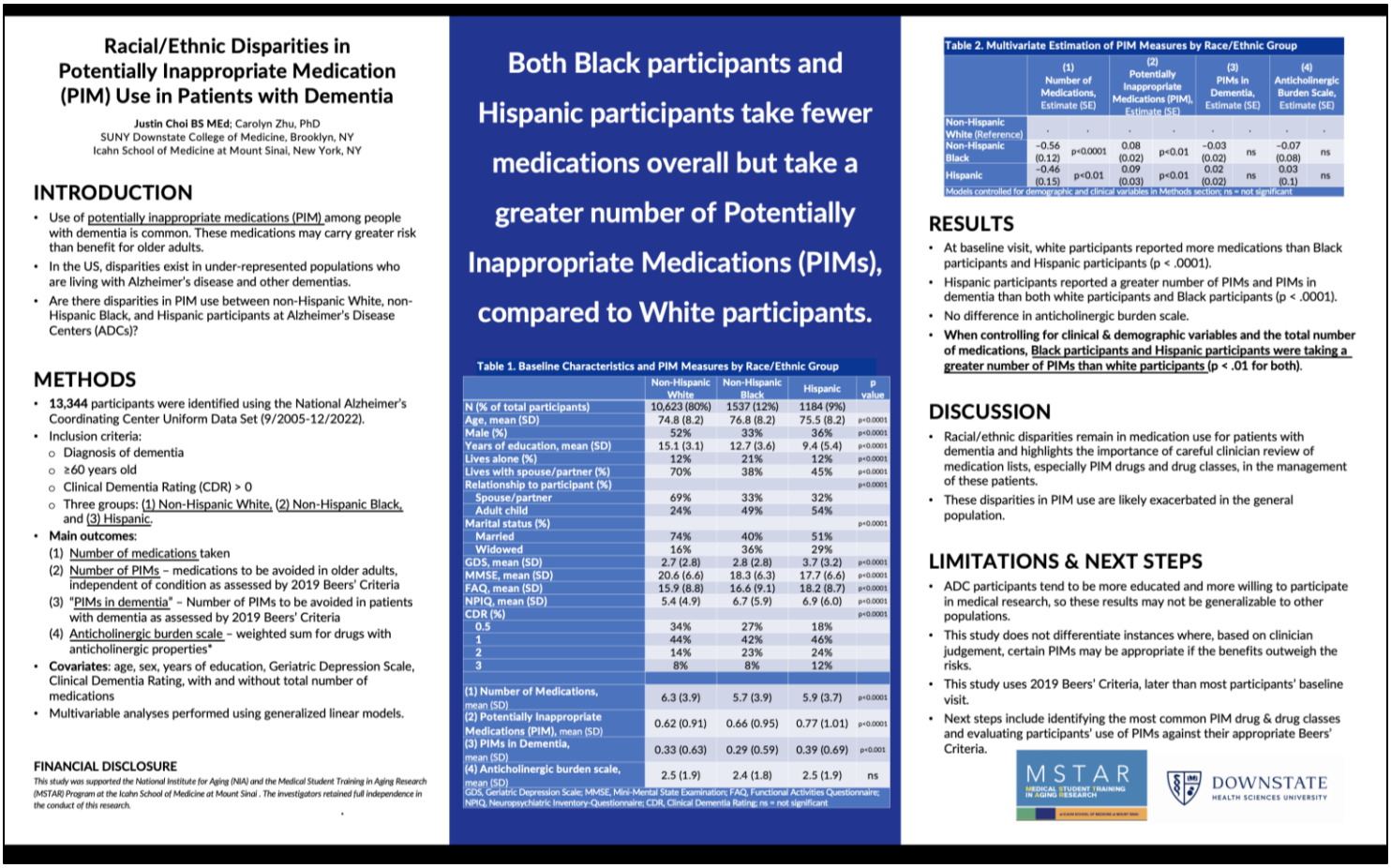

Racial/Ethnic Disparities in Potentially Inappropriate Medication (PIM) Use in Patients with Dementia

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INTRODUCTION

- Use of potentially inappropriate medications (PIM) among people with dementia is common. These medications may carry greater risk than benefit for older adults.
- In the US, disparities exist in under-represented populations who are living with Alzheimer's disease and other dementias.
- Are there disparities in PIM use between non-Hispanic White, non-Hispanic Black, and Hispanic participants at Alzheimer's Disease Centers (ADCs)?

METHODS

- **13,344** participants were identified using the National Alzheimer's Coordinating Center Uniform Data Set (9/2005-12/2022).
- Inclusion criteria:
  - Diagnosis of dementia
  - ≥60 years old
  - Clinical Dementia Rating (CDR) > 0
  - Three groups: (1) Non-Hispanic White, (2) Non-Hispanic Black, and (3) Hispanic.
- **Main outcomes**:
  (1) Number of medications taken
  (2) Number of PIMs – medications to be avoided in older adults, independent of condition as assessed by 2019 Beers' Criteria
  (3) "PIMs in dementia" – Number of PIMs to be avoided in patients with dementia as assessed by 2019 Beers' Criteria
  (4) Anticholinergic burden scale – weighted sum for drugs with anticholinergic properties*
- **Covariates**: age, sex, years of education, Geriatric Depression Scale, Clinical Dementia Rating, with and without total number of medications
- Multivariable analyses performed using generalized linear models.

FINANCIAL DISCLOSURE
This study was supported the National Institute for Aging (NIA) and the Medical Student Training in Aging Research (MSTAR) Program at the Icahn School of Medicine at Mount Sinai . The investigators retained full independence in the conduct of this research.

Both Black participants and Hispanic participants take fewer medications overall but take a greater number of Potentially Inappropriate Medications (PIMs), compared to White participants.

Table 1. Baseline Characteristics and PIM Measures by Race/Ethnic Group

	Non-Hispanic White	Non-Hispanic Black	Hispanic	p value
N (% of total participants)	10,623 (80%)	1537 (12%)	1184 (9%)	
Age, mean (SD)	74.8 (8.2)	76.8 (8.2)	75.5 (8.2)	p<0.0001
Male (%)	52%	33%	36%	p<0.0001
Years of education, mean (SD)	15.1 (3.1)	12.7 (3.6)	9.4 (5.4)	p<0.0001
Lives alone (%)	12%	21%	12%	p<0.0001
Lives with spouse/partner (%)	70%	38%	45%	p<0.0001
Relationship to participant (%)				p<0.0001
Spouse/partner	69%	33%	32%	
Adult child	24%	49%	54%	
Marital status (%)				p<0.0001
Married	74%	40%	51%	
Widowed	16%	36%	29%	
GDS, mean (SD)	2.7 (2.8)	2.8 (2.8)	3.7 (3.2)	p<0.0001
MMSE, mean (SD)	20.6 (6.6)	18.3 (6.3)	17.7 (6.6)	p<0.0001
FAQ, mean (SD)	15.9 (8.8)	16.6 (9.1)	18.2 (8.7)	p<0.0001
NPIQ, mean (SD)	5.4 (4.9)	6.7 (5.9)	6.9 (6.0)	p<0.0001
CDR (%)				p<0.0001
0.5	34%	27%	18%	
1	44%	42%	46%	
2	14%	23%	24%	
3	8%	8%	12%	
(1) Number of Medications, mean (SD)	6.3 (3.9)	5.7 (3.9)	5.9 (3.7)	p<0.0001
(2) Potentially Inappropriate Medications (PIM), mean (SD)	0.62 (0.91)	0.66 (0.95)	0.77 (1.01)	p<0.0001
(3) PIMs in Dementia, mean (SD)	0.33 (0.63)	0.29 (0.59)	0.39 (0.69)	p<0.001
(4) Anticholinergic burden scale, mean (SD)	2.5 (1.9)	2.4 (1.8)	2.5 (1.9)	ns

GDS, Geriatric Depression Scale; MMSE, Mini-Mental State Examination; FAQ, Functional Activities Questionnaire; NPIQ, Neuropsychiatric Inventory-Questionnaire; CDR, Clinical Dementia Rating; ns = not significant

Table 2. Multivariate Estimation of PIM Measures by Race/Ethnic Group

	(1) Number of Medications, Estimate (SE)		(2) Potentially Inappropriate Medications (PIM), Estimate (SE)		(3) PIMs in Dementia, Estimate (SE)		(4) Anticholinergic Burden Scale, Estimate (SE)	
Non-Hispanic White (Reference)	.	.	.	.	.	.	.	.
Non-Hispanic Black	−0.56 (0.12)	p<0.0001	0.08 (0.02)	p<0.01	−0.03 (0.02)	ns	−0.07 (0.08)	ns
Hispanic	−0.46 (0.15)	p<0.01	0.09 (0.03)	p<0.01	0.02 (0.02)	ns	0.03 (0.1)	ns

Models controlled for demographic and clinical variables in Methods section; ns = not significant

RESULTS

- At baseline visit, white participants reported more medications than Black participants and Hispanic participants (p < .0001).
- Hispanic participants reported a greater number of PIMs and PIMs in dementia than both white participants and Black participants (p < .0001).
- No difference in anticholinergic burden scale.
- **When controlling for clinical & demographic variables and the total number of medications, Black participants and Hispanic participants were taking a greater number of PIMs than white participants (p < .01 for both).**

DISCUSSION

- Racial/ethnic disparities remain in medication use for patients with dementia and highlights the importance of careful clinician review of medication lists, especially PIM drugs and drug classes, in the management of these patients.
- These disparities in PIM use are likely exacerbated in the general population.

LIMITATIONS & NEXT STEPS

- ADC participants tend to be more educated and more willing to participate in medical research, so these results may not be generalizable to other populations.
- This study does not differentiate instances where, based on clinician judgement, certain PIMs may be appropriate if the benefits outweigh the risks.
- This study uses 2019 Beers' Criteria, later than most participants' baseline visit.
- Next steps include identifying the most common PIM drug & drug classes and evaluating participants' use of PIMs against their appropriate Beers' Criteria.

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"Both Black participants and Hispanic participants take fewer medications overall but take a greater number of Potentially Inappropriate Medications (PIMs), compared to White participants."

RACIAL/ETHNIC DISPARITIES IN POTENTIALLY INAPPROPRIATE MEDICATION (PIM) USE IN PATIENTS WITH DEMENTIA

Justin Choi, BS MEd; Carolyn Zhu, PhD

Introduction: Use of potentially inappropriate medications (PIM) is common among people with dementia. In the United States, disparities exist in underserved racial/ethnicity groups who are living with Alzheimer's disease and other dementias. It is unclear if there are disparities in PIM use by racial/ethnicity group among research participants at Alzheimer's Disease Centers.

Methods: Data were drawn from the National Alzheimer's Coordinating Center Uniform Data Set (9/2005-12/2022). Baseline inclusion criteria: ≥ 60 years old, diagnosis of dementia, and Clinical Dementia Rating (CDR) > 0. Sample separated into three race/ethnicity groups: Non-Hispanic white, Non-Hispanic Black, or Hispanic.

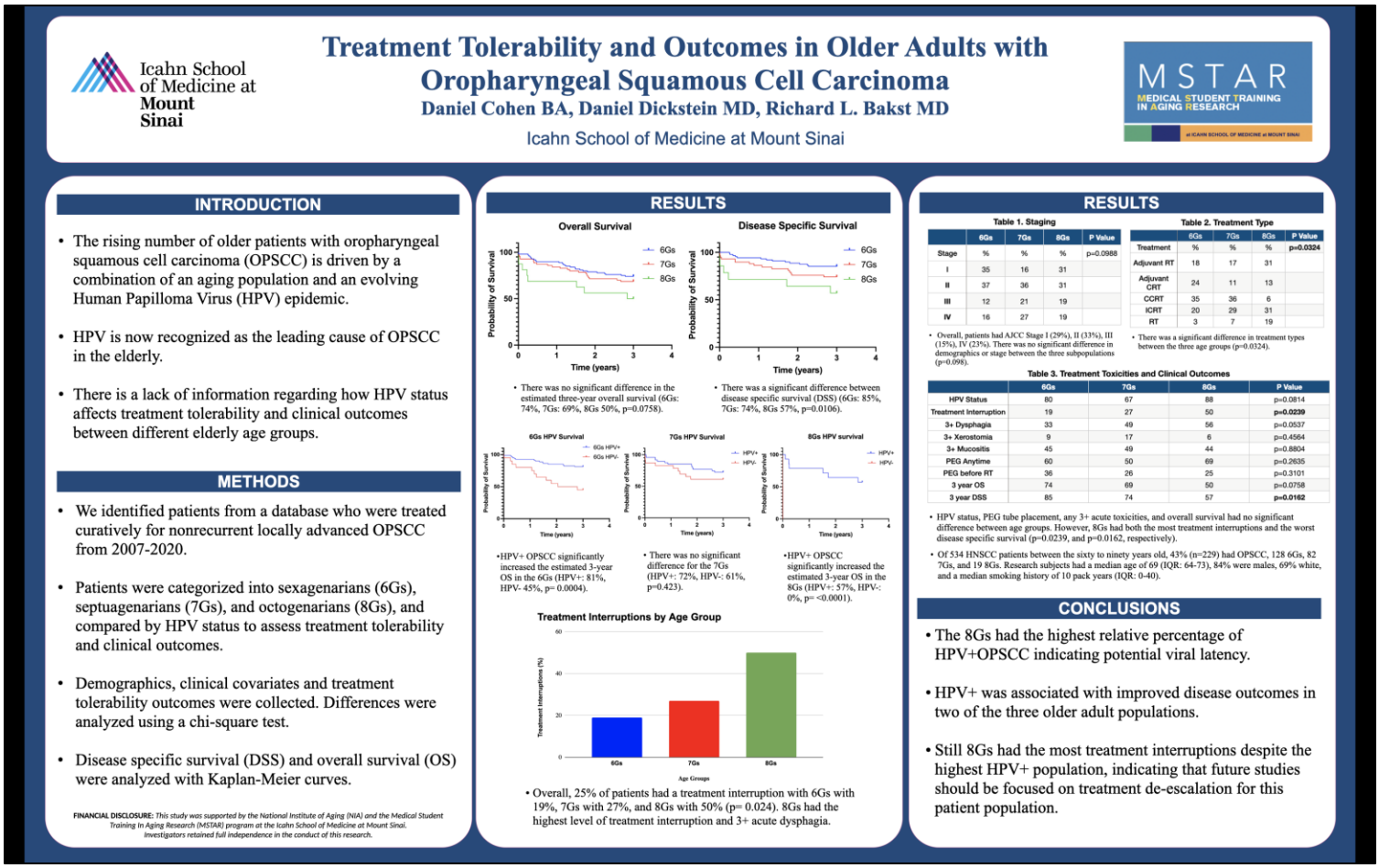
Main outcomes: (1) Number of medications taken, as polypharmacy predicts PIM use; (2) Number of PIMs as assessed by 2019 Beers' Criteria, medications to be avoided in older adults independent of diagnosis; (3) Number of "PIMs in dementia," medications to be avoided in patients with dementia, as assessed by 2019 Beers' Criteria; and (4) anticholinergic burden scale, weighted sum of drugs with anticholinergic properties, avoided in patients with dementia due to adverse CNS effects. Multivariable analyses of these outcomes against race/ethnicity, controlling for clinical and demographic variables, performed using generalized linear models.

Results: Sample included 10,623 white, 1,537 Black, and 1,184 Hispanic participants (total n=13,344). Controlling for clinical and demographic variables (age, sex, years of education, global depression scale, and CDR), Black and Hispanic participants were taking fewer medications than white participants ($p < .0001$ and $p < .01$ respectively). When additionally controlling for total number of medications, Black and Hispanic participants were taking a greater number of PIMs compared to white participants ($p < .01$ for both groups). There was no difference with regards to PIMs in dementia or anticholinergic burden scale.

Conclusions: At study enrollment, racial/ethnic minorities were taking a fewer number of total medications, yet, when controlling for clinical and demographic variables, were taking a greater number of potentially inappropriate medications. Among patients with dementia, racial/ethnic disparities remain in medication use and highlight the importance of careful clinician review of medication lists in the management of these patients.

Treatment Tolerability and Outcomes in Older Adults with Oropharyngeal Squamous Cell Carcinoma

Daniel Cohen BA, Daniel Dickstein MD, Richard L. Bakst MD
Icahn School of Medicine at Mount Sinai



Icahn School of Medicine at Mount Sinai

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MSTAR MEDICAL STUDENT TRAINING IN AGING RESEARCH

INTRODUCTION

- The rising number of older patients with oropharyngeal squamous cell carcinoma (OPSCC) is driven by a combination of an aging population and an evolving Human Papilloma Virus (HPV) epidemic.
- HPV is now recognized as the leading cause of OPSCC in the elderly.
- There is a lack of information regarding how HPV status affects treatment tolerability and clinical outcomes between different elderly age groups.

METHODS

- We identified patients from a database who were treated curatively for nonrecurrent locally advanced OPSCC from 2007-2020.
- Patients were categorized into sexagenarians (6Gs), septuagenarians (7Gs), and octogenarians (8Gs), and compared by HPV status to assess treatment tolerability and clinical outcomes.
- Demographics, clinical covariates and treatment tolerability outcomes were collected. Differences were analyzed using a chi-square test.
- Disease specific survival (DSS) and overall survival (OS) were analyzed with Kaplan-Meier curves.

FINANCIAL DISCLOSURE: *This study was supported by the National Institute of Aging (NIA) and the Medical Student Training In Aging Research (MSTAR) program at the Icahn School of Medicine at Mount Sinai. Investigators retained full independence in the conduct of this research.*

RESULTS

Overall Survival

Disease Specific Survival

- There was no significant difference in the estimated three-year overall survival (6Gs: 74%, 7Gs: 69%, 8Gs 50%, p=0.0758).
- There was a significant difference between disease specific survival (DSS) (6Gs: 85%, 7Gs: 74%, 8Gs 57%, p=0.0106).

6Gs HPV Survival

7Gs HPV Survival

8Gs HPV survival

- HPV+ OPSCC significantly increased the estimated 3-year OS in the 6Gs (HPV+: 81%, HPV- 45%, p= 0.0004).
- There was no significant difference for the 7Gs (HPV+: 72%, HPV-: 61%, p=0.423).
- HPV+ OPSCC significantly increased the estimated 3-year OS in the 8Gs (HPV+: 57%, HPV-: 0%, p= <0.0001).

Treatment Interruptions by Age Group

- Overall, 25% of patients had a treatment interruption with 6Gs with 19%, 7Gs with 27%, and 8Gs with 50% (p= 0.024). 8Gs had the highest level of treatment interruption and 3+ acute dysphagia.

RESULTS

Table 1. Staging

	6Gs	7Gs	8Gs	P Value
Stage	%	%	%	p=0.0988
I	35	16	31	
II	37	36	31	
III	12	21	19	
IV	16	27	19	

- Overall, patients had AJCC Stage I (29%), II (33%), III (15%), IV (23%). There was no significant difference in demographics or stage between the three subpopulations (p=0.098).

Table 2. Treatment Type

	6Gs	7Gs	8Gs	P Value
Treatment	%	%	%	**p=0.0324**
Adjuvant RT	18	17	31	
Adjuvant CRT	24	11	13	
CCRT	35	36	6	
ICRT	20	29	31	
RT	3	7	19	

- There was a significant difference in treatment types between the three age groups (p=0.0324).

Table 3. Treatment Toxicities and Clinical Outcomes

	6Gs	7Gs	8Gs	P Value
HPV Status	80	67	88	p=0.0814
Treatment Interruption	19	27	50	**p=0.0239**
3+ Dysphagia	33	49	56	p=0.0537
3+ Xerostomia	9	17	6	p=0.4564
3+ Mucositis	45	49	44	p=0.8804
PEG Anytime	60	50	69	p=0.2635
PEG before RT	36	26	25	p=0.3101
3 year OS	74	69	50	p=0.0758
3 year DSS	85	74	57	**p=0.0162**

- HPV status, PEG tube placement, any 3+ acute toxicities, and overall survival had no significant difference between age groups. However, 8Gs had both the most treatment interruptions and the worst disease specific survival (p=0.0239, and p=0.0162, respectively).
- Of 534 HNSCC patients between the sixty to ninety years old, 43% (n=229) had OPSCC, 128 6Gs, 82 7Gs, and 19 8Gs. Research subjects had a median age of 69 (IQR: 64-73), 84% were males, 69% white, and a median smoking history of 10 pack years (IQR: 0-40).

CONCLUSIONS

- The 8Gs had the highest relative percentage of HPV+OPSCC indicating potential viral latency.
- HPV+ was associated with improved disease outcomes in two of the three older adult populations.
- Still 8Gs had the most treatment interruptions despite the highest HPV+ population, indicating that future studies should be focused on treatment de-escalation for this patient population.

"Octogenarians had the highest relative percentage of human papilloma virus+ oropharyngeal squamous cell carcinoma indicating potential viral latency."

TREATMENT TOLERABILITY AND OUTCOMES IN OLDER ADULTS WITH OROPHARYNGEAL SQUAMOUS CELL CARCINOMA

Daniel Cohen, Daniel Dickstein, Richard Bakst

Introduction: The rising number of older patients with oropharyngeal squamous cell carcinoma (OPSCC) is driven by a combination of an aging population and an evolving Human Papilloma Virus (HPV) epidemic, with HPV now recognized as the leading cause of OPSCC in the elderly. Given this, there will be an increased disease burden for this cohort. Still, there is a lack of information regarding how HPV status affects treatment tolerability and clinical outcomes between different elderly age groups.

Methods: We identified patients from a database who were treated curatively for nonrecurrent locally advanced OPSCC from 2007-2020. Patients were categorized into sexagenarians (6Gs), septuagenarians (7Gs), and octogenarians (8Gs), and compared by HPV status to assess treatment tolerability and clinical outcomes. Demographics, clinical covariates and treatment tolerability outcomes were collected. Differences were analyzed using a chi-square test. Disease specific survival (DSS) and overall survival (OS) were analyzed with Kaplan-Meier curves.

Results: Of 534 HNSCC patients between the sixty to ninety years old, 43% (n=229) had OPSCC, 128 6Gs, 82 7Gs, and 19 8Gs. Research subjects had a median age of 69 (IQR: 64-73), 84% were males, 69% white, and a median smoking history of 10 pack years (IQR: 0-40). Patients had AJCC Stage I (29%), II (33%), III (15%), IV (23%). There was no significant difference in demographics or stage between the three subpopulations (p=0.098). Patients were treated with adjuvant radiation (RT) (17%), adjuvant chemoradiation (CRT) (16%), induction/concurrent CRT (32%), concurrent CRT (22%), surgery alone (8%) or RT (6%). Among patients who received HPV testing and underwent RT (n=186), 6Gs were 80% HPV+, 7Gs were 67 % HPV+, and 8Gs were 88% HPV+ (p=0.082). Overall, 25% of patients had a treatment interruption with 6Gs with 19%, 7Gs with 27%, and 8Gs with 50% (p= 0.024). Percutaneous endogastric tubes were placed during or before RT treatment in 6Gs 60% of the time, 7Gs 50%, and 8Gs 69% (p=0.264). There was no difference between the age groups in treatment toxicities with acute 3+ dysphagia, xerostomia, or mucositis (p values: 0.053, 0.456, 0.880, respectively). There was no significant difference in the estimated three-year overall survival (6Gs: 74%, 7Gs: 69%, 8Gs 50%, p=0.0758) when stratified by age. However, there was a significant difference between disease specific survival (DSS) (6Gs: 85%, 7Gs: 74%, 8Gs 57%, p=0.0106) when stratified by age group. HPV+ OPSCC significantly increased the estimated 3-year OS compared to HPV- OPSCC in the 6Gs (HPV+: 81%, HPV- 45%, p= 0.0004 and 8Gs (HPV+: 57%, HPV-: 0%, p= <0.0001). However, there was no significant difference for the 7Gs (HPV+: 72%, HPV-: 61%, p=0.423)

Conclusions: The 8Gs had the highest relative percentage of HPV+OPSCC indicating potential viral latency. HPV+ was associated with improved disease outcomes in two of the three older adult populations. Still 8Gs had the most treatment interruptions despite the highest HPV+ population, indicating that future studies should be focused on treatment de-escalation for this patient population.

Comparative Analysis of Geriatric Surgical Outcomes Between Anterior and Posterior Cervical Fusion: A 30-Year Study Using the National Inpatient Sample Database

Bahie Ezzat MS, Trevor Hardigan MD, Alexander Schüpper MD, Eugene Hrabarchuk BS, Tanvir Choudhri MD

Comparative Analysis of Geriatric Surgical Outcomes Between Anterior and Posterior Cervical Fusion: A 30-Year Study Using the National Inpatient Sample Database

Bahie Ezzat MS, Trevor Hardigan MD, Alexander Schüpper MD, Eugene Hrabarchuk BS, Tanvir Choudhri MD

INTRODUCTION

- Cervical Spondylotic Myelopathy (CSM) is the most common cause of spinal cord dysfunction in persons more than 65 years of age globally.[1]
- Anterior and posterior cervical fusion (ACDF/PCDF) are the standard CSM treatments, with elderly-specific complications.[2,3]
- Age-stratified studies comparing the frequency and severity of perioperative complications of ACDF and PCDF are limited.[4]
- Study aims to examine ACDF/PCDF risk factors, outcomes, and complication rates, focusing on the elderly.

METHODS

- National Inpatient Sample (NIS) Database provides a nationally representative sample of all inpatient hospital discharges in the US.[5]
- Authors analyzed 2000-2020 NIS data on patients over 65 undergoing ACDF/PCDF for degenerative disorders, myelopathy, or radiculopathy.
- Authors estimated the prevalence of demographic characteristics, preoperative diagnoses, and common medical comorbidities using means or proportions as appropriate.
- Statistical analyses were conducted using the R program.

RESULTS

Demographics:

- Cohort comprised 587,838 patients; 457,396 ACDF; 130,442 PCDF.
- Females constituted 46.8% of the cohort, with a higher percentage in the ACDF group (48.6%).
- Mean age was 58.21, with the PCDF group being older (62.33) compared to the ACDF group (57.04).

Insurance Status:

- Medicare was the most common insurance payer (37.6%), with a significantly higher percentage in the PCDF group (49.5%).
- Private insurance covered 45.5% of the cohort, with a higher percentage in the ACDF group (48.7%).

Regional Distribution:

- Significant portion of the cohort was from the South region (44.6%), with the majority being in the ACDF group (46.6%).
- Majority of the cohort was treated at Urban teaching hospitals (63.6%), especially in the PCDF group (77.8%).

Comorbidity:

- Myelopathy was the most common condition in both groups, but more prevalent in the PCDF cohort (86.4% vs. 76.9% in ACDF).
- Hypertension was the most prevalent comorbidity (51.5%), significantly more so in the PCDF group (62.0%).
- Elixhauser Comorbidity Score was significantly higher in the PCDF group (2.16) compared to the ACDF group (0.83).

Outcomes:

- Mean length of stay was 2.90 days, longer for the PCDF group (4.86 days) compared to the ACDF group (2.34 days).
- The mean total hospital charge was $71,829.43, with higher charges for the PCDF group ($107K) compared to the ACDF group ($62K).
- 77.1% of the cohort was discharged home or to a short-term hospital, with a much higher percentage in the ACDF group (84.3%).

In general, patients in the PCDF cohort were older, had higher comorbidity scores, stayed longer in the hospital, and had more diverse insurance coverage. These differences in demographic and health characteristics may have influenced the outcomes and costs associated with their care.

Table 1. Summary of Demographics, Perioperative Complications, and Clinical Outcomes

Variable Unmatched	Total Cohort	ACDF	PCDF	P- value	SMD
N	587,838	457,396	130,442		
Female (N, %)	275,199 (46.8)	222,375 (48.6)	52,824 (40.5)	<0.001	0.164
Age (mean (SD))	58.21 (11.88)	57.04 (11.73)	62.33 (11.50)	<0.001	0.455
Insurance Payer (N, %)				<0.001	0.344
Medicaid	45,613 (7.8)	34,293 (7.5)	11,320 (8.7)		
Medicare	220,747 (37.6)	156,264 (34.2)	64,483 (49.5)		
No charge	1,098 (0.2)	841 (0.2)	257 (0.2)		
Other	42,926 (7.3)	35,556 (7.8)	7,370 (5.7)		
Private insurance	267,075 (45.5)	222,438 (48.7)	44,637 (34.3)		
Self pay	8,984 (1.5)	6,903 (1.5)	2,081 (1.6)		
Region (N, %)				<0.001	0.217
Midwest	121,310 (20.6)	91,952 (20.1)	29,358 (22.5)		
Northeast	87,708 (14.9)	61,612 (13.5)	26,095 (20.0)		
South	262,305 (44.6)	213,057 (46.6)	49,249 (37.8)		
West	116,515 (19.8)	90,775 (19.8)	25,740 (19.7)		
Race (N, %)				<0.001	0.151
Asian	8,390 (1.6)	6,078 (1.5)	2,312 (2.0)		
Black	66,155 (12.8)	46,844 (11.7)	19,310 (16.3)		
Hispanic	29,261 (5.7)	21,732 (5.4)	7,530 (6.4)		
Native American	2,714 (0.5)	2,108 (0.5)	606 (0.5)		
Other	12,497 (2.4)	9,444 (2.4)	3,053 (2.6)		
White	398,160 (77.0)	312,790 (78.4)	85,370 (72.2)		
Hospital Location and Teaching Status (N, %)				<0.001	0.404
Rural	23,901 (4.1)	20,724 (4.5)	3,178 (2.4)		
Urban nonteaching	190,274 (32.4)	164,550 (36.0)	25,723 (19.7)		
Urban teaching	373,663 (63.6)	272,122 (59.5)	101,540 (77.8)		
Hospital Bedsize (N, %)				<0.001	0.139
Large	363,424 (61.8)	276,753 (60.5)	86,671 (66.4)		
Medium	136,161 (23.2)	107,781 (23.6)	28,380 (21.8)		
Small	88,253 (15.0)	72,863 (15.9)	15,391 (11.8)		
Median Household Income (N, %)				<0.001	0.035
0-25th Percentile	135,740 (25.6)	103,499 (25.4)	32,241 (26.4)		
26th-50th Percentile	137,936 (26.0)	107,329 (26.3)	30,607 (25.1)		
51st-75th Percentile	136,133 (25.7)	105,161 (25.8)	30,972 (25.4)		
76th-100th Percentile	120,320 (22.7)	92,091 (22.6)	28,228 (23.1)		
Elixhauser Comorbidity Score (mean (SD))	1.13 (4.35)	0.83 (3.94)	2.16 (5.41)	<0.001	0.280
Acute Kidney Injury (N, %)	6,001 (1.0)	3,042 (0.7)	2,958 (2.3)	<0.001	0.134
Anticoagulant Use (N, %)	8,576 (1.5)	5,766 (1.3)	2,810 (2.2)	<0.001	0.069
Diabetes (N, %)	116,496 (19.8)	84,851 (18.6)	31,645 (24.3)	<0.001	0.140
Deep Vein Thrombosis (N, %)	1,421 (0.2)	794 (0.2)	626 (0.5)	<0.001	0.054
Hyperlipidemia (N, %)	162,107 (27.6)	116,774 (25.5)	45,333 (34.8)	<0.001	0.202
Hypertension (N, %)	302,908 (51.5)	222,046 (48.5)	80,862 (62.0)	<0.001	0.273
Procedural Complication (N, %)	3,375 (0.6)	2,010 (0.4)	1,365 (1.0)	<0.001	0.071
Peg/G-tube (N, %)	2,655 (0.5)	1,990 (0.4)	664 (0.5)	0.112	0.011
Prothrombotic Disorder (N, %)	2,132 (0.4)	1,490 (0.3)	642 (0.5)	<0.001	0.026
Smoker (N, %)	159,864 (27.2)	124,197 (27.2)	35,667 (27.3)	0.540	0.004
Systemic Inflammatory Disease (N, %)	113,126 (19.2)	75,205 (16.4)	37,920 (29.1)	<0.001	0.305
Tracheostomy (N, %)	1,359 (0.2)	842 (0.2)	517 (0.4)	<0.001	0.039
Paresis/Plegia (N, %)	1,628 (0.3)	1,112 (0.2)	516 (0.4)	<0.001	0.027
Obesity (N, %)	71,750 (12.2)	53,627 (11.7)	18,123 (13.9)	<0.001	0.065
Fluid and Electrolyte Dysfunction	29,610 (5.0)	16,175 (3.5)	13,436 (10.3)	<0.001	0.269
Pneumonia (N, %)	4,475 (0.8)	2,584 (0.6)	1,891 (1.4)	<0.001	0.089
Chronic Kidney Disease (N, %)	19,920 (3.4)	11,918 (2.6)	8,001 (6.1)	<0.001	0.173
Chronic Obstructive Pulmonary Disease (N, %)	49,904 (8.5)	35,379 (7.7)	14,525 (11.1)	<0.001	0.117
Myelopathy (N, %)	464,231 (79.0)	351,582 (76.9)	112,650 (86.4)	<0.001	0.247
Spinal Stenosis (N, %)	154,373 (26.3)	111,194 (24.3)	43,179 (33.1)	<0.001	0.195
Spondylolysis (N, %)	26,122 (4.4)	21,459 (4.7)	4,664 (3.6)	<0.001	0.056
Radiculopathy (N, %)	137,414 (23.4)	116,080 (25.4)	21,334 (16.4)	<0.001	0.223
Spinal Disc Disorder (N, %)	190,921 (32.5)	170,914 (37.4)	20,008 (15.3)	<0.001	0.516
Cervical Instability (N, %)	5,039 (0.9)	2,488 (0.5)	2,551 (2.0)	<0.001	0.127
Cervicalgia (N, %)	6,351 (1.1)	5,077 (1.1)	1,274 (1.0)	0.064	0.013
Cerebrospinal Fluid Leak (N, %)	2,309 (0.4)	1,439 (0.3)	870 (0.7)	<0.001	0.050
Nervous Injury Surgical Complication (N, %)	1,240 (0.2)	840 (0.2)	400 (0.3)	<0.001	0.025
Spinal Wound Complication (N , %)	978 (0.2)	375 (0.1)	603 (0.5)	<0.001	0.073
In-hospital Mortality (N, %)	1,376 (0.2)	913 (0.2)	464 (0.4)	<0.001	0.030
Discharge Home or Short-term hospital (N, %)	453,178 (77.1)	385,760 (84.3)	67,418 (51.7)	<0.001	0.747
Length of Stay (mean (SD))	2.90 (3.88)	2.34 (3.36)	4.86 (4.83)	<0.001	0.607
Total Hospital Charges (mean (SD))	71,829.43 (64,861.89)	61,975.39 (54,967.17)	106,653.14 (82,713.66)	<0.001	0.636

DISCUSSION

- **Efficacy of Surgical Techniques:** The comparison between anterior and posterior cervical fusion surgeries demonstrates distinct differences in outcomes. Factors like recovery time, surgical complications, and readmission rates should be considered when choosing the surgical approach for geriatric patients.
- **Impact on Geriatric Population:** The study emphasizes the need for careful consideration of surgical approach in geriatric patients due to their unique health complexities. Age-specific strategies could potentially optimize surgical outcomes.
- **Socioeconomic Factors:** The correlation between socioeconomic status and surgical outcomes needs to be further explored. There were noticeable disparities in outcomes based on these factors, pointing to potential barriers in access to quality healthcare.
- **Implications for Health Policy:** This comprehensive analysis of data from the National Inpatient Sample Database suggests potential opportunities for improving health policy, specifically around supporting quality care for geriatric patients and minimizing disparities in healthcare.
- **Future Research:** More research is needed to better understand the factors influencing the observed differences in surgical outcomes between anterior and posterior cervical fusion surgeries in geriatric patients. Future studies might incorporate other variables such as comorbidities, quality of post-operative care, and long-term follow-ups to build a more comprehensive understanding of these outcomes.

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"In general, patients in the PCDF cohort were older, had higher comorbidity scores, stayed longer in the hospital, and had more diverse insurance coverage. These differences in demographic and health characteristics may have influenced the outcomes and costs associated with their care."

COMPARATIVE ANALYSIS OF GERIATRIC SURGICAL OUTCOMES BETWEEN ANTERIOR AND POSTERIOR CERVICAL FUSION: A 30-YEAR STUDY USING THE NATIONAL INPATIENT SAMPLE DATABASE

Bahie Ezzat MS, Trevor Hardigan MD, Alexander Schüpper MD, Eugene Hrabarchuk BS, Tanvir Choudhri MD

Introduction: Cervical Spondylotic Myelopathy (CSM) is globally recognized as the leading cause of spinal cord dysfunction among individuals aged 65 years and above. The standard treatment modalities for CSM encompass Anterior and Posterior Cervical Fusion (ACDF/PCDF). Despite their critical role in managing CSM, there is a deficiency in age-stratified studies comparing the frequency and severity of perioperative complications associated with these treatments. Our research aims to address this gap by exploring risk factors, outcomes, and complication rates associated with ACDF/PCDF in elderly patients.

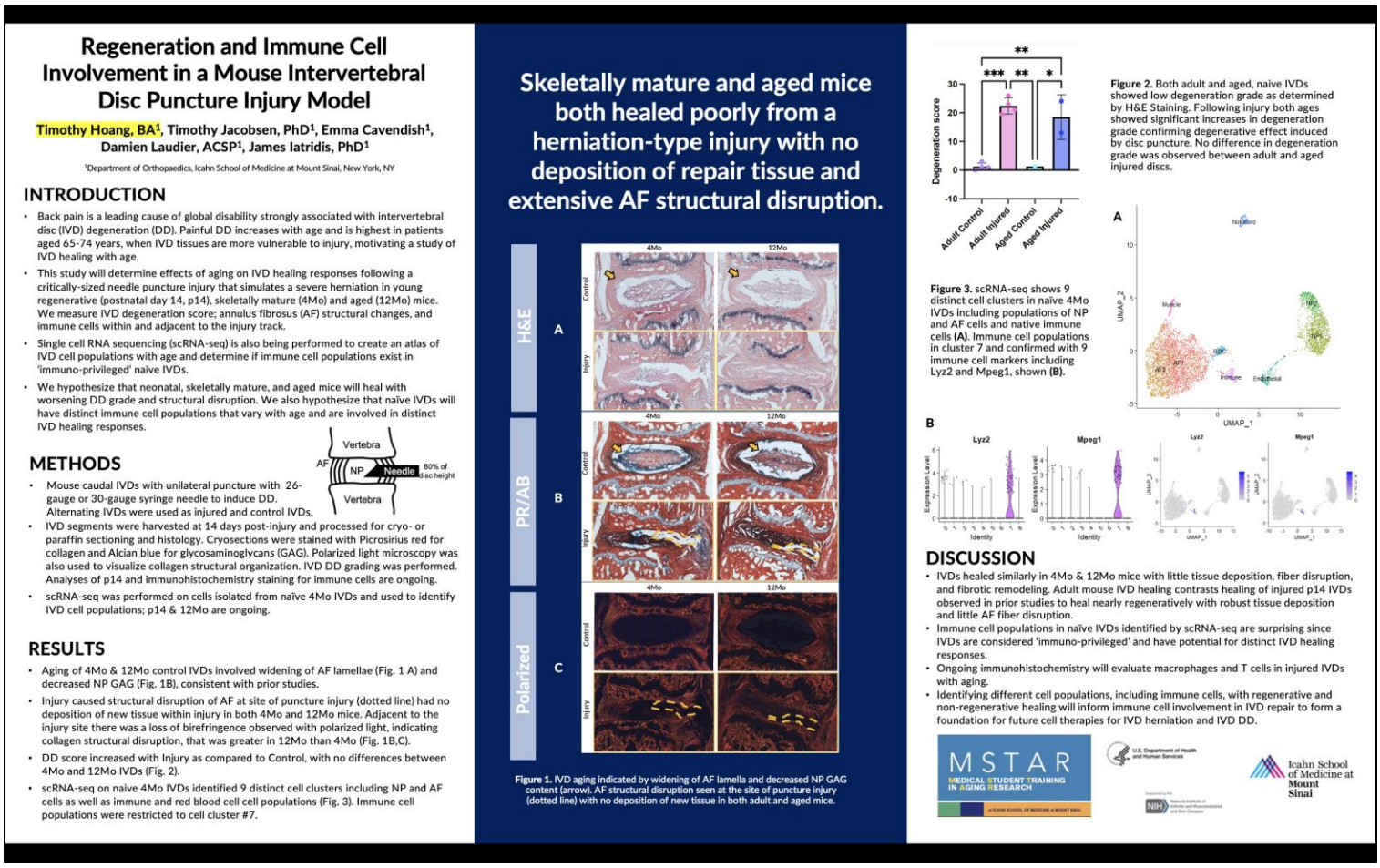
Methods: The study utilized the National Inpatient Sample (NIS) Database to examine data collected from 2000 to 2020. This database provides a nationally representative sample of all inpatient hospital discharges within the United States. The study population included patients aged 65 years and above who underwent ACDF/PCDF procedures to treat degenerative disorders, myelopathy, or radiculopathy. We employed the R programming language to conduct statistical analyses, estimating the prevalence of demographic characteristics, preoperative diagnoses, common medical comorbidities, and clinical outcomes.

Results: The study cohort included a total of 587,838 patients, with 457,396 undergoing ACDF and 130,442 undergoing PCDF procedures. Interestingly, the PCDF group presented with older patients, a higher proportion of females, and increased Elixhauser Comorbidity Scores. Compared to the ACDF group, PCDF patients exhibited lengthier hospital stays and higher hospital charges, and they were less likely to be discharged to home or short-term hospitals. Medicare was the predominant insurance coverage, particularly for the PCDF group. Conversely, private insurance was more frequent among ACDF patients. Geographical distribution identified a significant representation from the South region, primarily in the ACDF group. The majority of patients were treated at urban teaching hospitals, with a higher proportion in the PCDF group. The most common diagnoses were myelopathy and hypertension, notably prevalent in the PCDF cohort.

Conclusion: Collectively, our study demonstrates that patients in the PCDF cohort were generally older, exhibited higher comorbidity scores, had longer hospital stays, and utilized more diverse insurance coverage options. These variations in demographic and health characteristics might have significantly influenced their care outcomes and associated costs. The findings underscore the need for individualized surgical approaches and health policy enhancements to cater better to the unique needs of geriatric CSM patients.

Regeneration and Immune Cell Involvement in a Mouse Intervertebral Disc Puncture Injury Model

Timothy Hoang, BA, Timothy Jacobsen, PhD, Emma Cavendish, Damien Laudier, ACSP, James Iatridis, PhD
Department of Orthopaedics, Icahn School of Medicine at Mount Sinai, New York, NY



Regeneration and Immune Cell Involvement in a Mouse Intervertebral Disc Puncture Injury Model

Timothy Hoang, BA[1], Timothy Jacobsen, PhD[1], Emma Cavendish[1], Damien Laudier, ACSP[1], James Iatridis, PhD[1]

[1]Department of Orthopaedics, Icahn School of Medicine at Mount Sinai, New York, NY

INTRODUCTION

- Back pain is a leading cause of global disability strongly associated with intervertebral disc (IVD) degeneration (DD). Painful DD increases with age and is highest in patients aged 65-74 years, when IVD tissues are more vulnerable to injury, motivating a study of IVD healing with age.
- This study will determine effects of aging on IVD healing responses following a critically-sized needle puncture injury that simulates a severe herniation in young regenerative (postnatal day 14, p14), skeletally mature (4Mo) and aged (12Mo) mice. We measure IVD degeneration score; annulus fibrosus (AF) structural changes, and immune cells within and adjacent to the injury track.
- Single cell RNA sequencing (scRNA-seq) is also being performed to create an atlas of IVD cell populations with age and determine if immune cell populations exist in 'immuno-privileged' naïve IVDs.
- We hypothesize that neonatal, skeletally mature, and aged mice will heal with worsening DD grade and structural disruption. We also hypothesize that naïve IVDs will have distinct immune cell populations that vary with age and are involved in distinct IVD healing responses.

METHODS

- Mouse caudal IVDs with unilateral puncture with 26-gauge or 30-gauge syringe needle to induce DD. Alternating IVDs were used as injured and control IVDs.
- IVD segments were harvested at 14 days post-injury and processed for cryo- or paraffin sectioning and histology. Cryosections were stained with Picrosirius red for collagen and Alcian blue for glycosaminoglycans (GAG). Polarized light microscopy was also used to visualize collagen structural organization. IVD DD grading was performed. Analyses of p14 and immunohistochemistry staining for immune cells are ongoing.
- scRNA-seq was performed on cells isolated from naïve 4Mo IVDs and used to identify IVD cell populations; p14 & 12Mo are ongoing.

RESULTS

- Aging of 4Mo & 12Mo control IVDs involved widening of AF lamellae (Fig. 1 A) and decreased NP GAG (Fig. 1B), consistent with prior studies.
- Injury caused structural disruption of AF at site of puncture injury (dotted line) had no deposition of new tissue within injury in both 4Mo and 12Mo mice. Adjacent to the injury site there was a loss of birefringence observed with polarized light, indicating collagen structural disruption, that was greater in 12Mo than 4Mo (Fig. 1B,C).
- DD score increased with Injury as compared to Control, with no differences between 4Mo and 12Mo IVDs (Fig. 2).
- scRNA-seq on naïve 4Mo IVDs identified 9 distinct cell clusters including NP and AF cells as well as immune and red blood cell cell populations (Fig. 3). Immune cell populations were restricted to cell cluster #7.

Skeletally mature and aged mice both healed poorly from a herniation-type injury with no deposition of repair tissue and extensive AF structural disruption.

Figure 1. IVD aging indicated by widening of AF lamella and decreased NP GAG content (arrow). AF structural disruption seen at the site of puncture injury (dotted line) with no deposition of new tissue in both adult and aged mice.

Figure 2. Both adult and aged, naive IVDs showed low degeneration grade as determined by H&E Staining. Following injury both ages showed significant increases in degeneration grade confirming degenerative effect induced by disc puncture. No difference in degeneration grade was observed between adult and aged injured discs.

Figure 3. scRNA-seq shows 9 distinct cell clusters in naïve 4Mo IVDs including populations of NP and AF cells and native immune cells **(A)**. Immune cell populations in cluster 7 and confirmed with 9 immune cell markers including Lyz2 and Mpeg1, shown **(B)**.

DISCUSSION

- IVDs healed similarly in 4Mo & 12Mo mice with little tissue deposition, fiber disruption, and fibrotic remodeling. Adult mouse IVD healing contrasts healing of injured p14 IVDs observed in prior studies to heal nearly regeneratively with robust tissue deposition and little AF fiber disruption.
- Immune cell populations in naïve IVDs identified by scRNA-seq are surprising since IVDs are considered 'immuno-privileged' and have potential for distinct IVD healing responses.
- Ongoing immunohistochemistry will evaluate macrophages and T cells in injured IVDs with aging.
- Identifying different cell populations, including immune cells, with regenerative and non-regenerative healing will inform immune cell involvement in IVD repair to form a foundation for future cell therapies for IVD herniation and IVD DD.

MSTAR MEDICAL STUDENT TRAINING IN AGING RESEARCH

U.S. Department of Health and Human Services

NIH

Icahn School of Medicine at Mount Sinai

"Skeletally mature and aged mice both healed poorly from a herniation-type injury with no deposition of repair tissue and extensive AF structural disruption."

REGENERATION AND IMMUNE CELL INVOLVEMENT IN A MOUSE INTERVERTEBRAL DISC PUNCTURE INJURY MODEL

Timothy Hoang, BA, Timothy Jacobsen, PhD, Emma Cavendish, Damien Laudier, ACSP, James Iatridis, PhD. Department of Orthopaedics, Icahn School of Medicine at Mount Sinai, New York, NY

Background: Back pain is a leading cause of global disability associated with intervertebral disc (IVD) degeneration (DD). Painful DD increases with age and is highest in patients aged 65-74 years, when IVD tissues are more vulnerable to injury, motivating a study of IVD healing with age. This study will determine effects of aging on IVD healing responses following a needle puncture injury that simulates a severe herniation in young regenerative (p14), skeletally mature (4Mo), and aged (12Mo) mice. We measure IVD degeneration score; annulus fibrosus (AF) structural changes, and immune cells within and adjacent to the injury track. Single cell RNA sequencing (scRNA-seq) is also being performed to create an atlas of IVD cell populations with age and determine if immune cell populations exist in 'immuno-privileged' naïve IVDs. We hypothesize that neonatal, skeletally mature, and aged mice will heal with worsening DD grade and structural disruption. We also hypothesize that naïve IVDs will have distinct immune cell populations that vary with age and are involved in distinct IVD healing responses.

Methods: Mouse caudal IVDs were punctured with 26-gauge or 30-gauge syringe needles to induce DD. Alternating IVDs were used as injured and control IVDs. IVD segments were harvested at 14 days post-injury and processed for cryo- or paraffin sectioning and histology. Cryosections were stained with Picrosirius red for collagen and Alcian blue for glycosaminoglycans (GAG). Polarized light microscopy was also used to visualize collagen structural organization. IVD DD grading was performed. Analyses of p14 and immunohistochemistry staining for immune cells are ongoing. scRNA-seq was performed on cells isolated from naïve 4Mo IVDs and used to identify IVD cell populations; p14 & 12Mo are ongoing.

Results: Aging of 4Mo & 12Mo control IVDs involved widening of AF lamellae and decreased NP GAG, consistent with prior studies. Injury caused structural disruption of AF at site of puncture injury and had no deposition of new tissue within injury in both 4Mo and 12Mo mice. Adjacent to the injury site was a loss of birefringence observed with polarized light, indicating collagen structural disruption, greater in 12Mo than 4Mo. DD score increased with injury as compared to control, with no differences between 4Mo and 12Mo IVDs . scRNA-seq on naive 4Mo IVDs identified 9 distinct cell clusters including NP and AF cells as well as immune and red blood cell cell populations. Immune cell populations were restricted to cell cluster #7.

Conclusion: IVDs healed similarly in 4Mo & 12Mo mice with little tissue deposition, fiber disruption, and fibrotic remodeling. Adult mouse IVD healing contrasts healing of injured p14 IVDs observed in prior studies to heal nearly regeneratively with robust tissue deposition and little AF fiber disruption. Immune cell populations in naïve IVDs identified by scRNA-seq are surprising since IVDs are considered 'immuno-privileged' and have potential for distinct IVD healing responses. Ongoing immunohistochemistry will evaluate macrophages and T cells in injured IVDs with aging. Identifying different cell populations, including immune cells, with regenerative and non-regenerative healing will inform immune cell involvement in IVD repair to form a foundation for future cell therapies for IVD herniation and IVD DD.

Social Navigation in Aging: Understanding Distancing Behavior in an Online Social Navigation Task

Shaun Kohli Sc.B, Matthew Schafer PhD, Daniela Schiller PhD
Icahn School of Medicine at Mount Sinai, New York, NY

Social Navigation in Aging: Understanding Distancing Behavior in an Online Social Navigation Task

PRESENTER: **Shaun Kohli**

BACKGROUND

- Studying changes to social behavior in aging populations is critical to understanding social isolation in the elderly
- Conventional self-report studies have implicit challenges in this domain, motivating the need for naturalistic experiments

AIM

- Use a novel social navigation task to examine how age influences a participant's tendency to push others away from oneself in an abstract social space

METHODS

- Cross-sectional study analyzed 890 participants who completed the task online (original sample: 629, validation sample: 261).
- Three factors ("social anxiety," "compulsivity," and "mood") were computed using a factor analysis of mental-health questionnaires from a post-task survey.
- Socially isolating behavior (SIB) in the task was measured using the average vector length between a participant's viewpoint and characters' final coordinates in the abstract social space. (See task description right)

RESULTS (see middle)

- Only age significantly correlated with participants' subjective perception of their own distancing behavior, as assessed through post-task reflections.
- This differs from other factors (i.e., social anxiety factor) that correlate with increased SIB in the task but not perceived SIB in the post-task reflection
- Increased age was associated with a greater trajectory stability within the task (proportion of trials each character spent near their final destinations)

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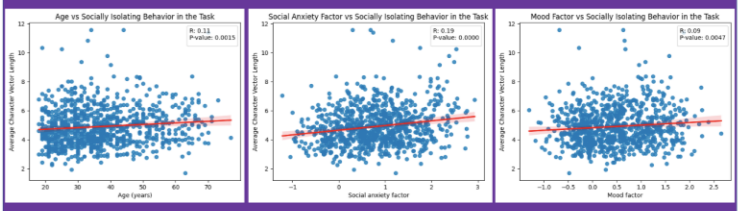
The analysis revealed a **significant association between age and heightened socially isolating behavior** within the task, irrespective of variables associated with social anxiety, mood, and compulsivity

Table 1: Ordinary Least Squares Regression for Predicting Socially Isolating Behavior in the Task

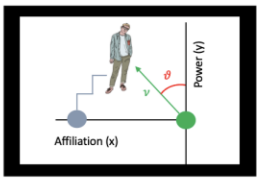
	Pooled Samples		Original Sample		Replication Sample	
Variable	coefficient	p value	coefficient	p value	coefficient	p value
Constant	+3.90	**< .001**	+3.90	**< .001**	+3.26	**< .001**
Age	+0.02	**< .001**	+0.01	**< .001**	+0.02	**< .001**
Social anxiety factor	+0.35	**< .001**	+0.33	**< .001**	+0.42	**< .001**
Mood factor	+0.19	**.004**	+0.16	**.033**	+0.30	**.029**
Compulsivity factor	-0.08	.304	-0.04	.632	-0.12	.352
Covid stringency index	-0.00	.508	-0.00	.976	+0.01	.642



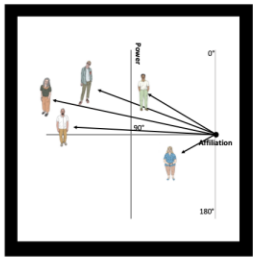
Figures 1-3: Single Variable Scatter Plots with Trend Lines of Variables Significantly Associated with Socially Isolating Behavior

Task Description:

1) Make social decisions as you interact with characters from a fictional town throughout the narrative.



2) These decisions move characters around in an abstract social space. Movement along the X axis depends on your decisions to affiliate more or less with the character. The Y axis depends on your decisions to take more or less power relative to a character.



3) At the end of the task, your SIB can be measured as the average vector length to each character

"The analysis revealed a significant association between age and heightened socially isolating behavior within the task, irrespective of variables associated with social anxiety, mood, and compulsivity."

SOCIAL NAVIGATION IN AGING: UNDERSTANDING DISTANCING BEHAVIOR IN AN ONLINE SOCIAL NAVIGATION TASK

Shaun Kohli Sc.B, Matthew Schafer PhD, Daniela Schiller PhD

Background: Studying social behavior in aging populations is crucial due to its implications for mental health and social isolation. Loneliness has been identified as a notable risk factor for many physical and mental health conditions, significantly affecting overall quality of life. This relevance is accentuated amid the COVID-19 pandemic, where social distancing measures have heightened social isolation among the elderly. However, conventional self-report questionnaires possess limitations when studying age-related changes in social behavior, stemming from biases associated with cognitive decline and memory deficits. Naturalistic experiments then emerge as a more suitable approach for exploring social dynamics in aging populations. Previous research in our lab demonstrated that a computer-based social navigation task reflects real-world social behavior. Participants engage in role-playing, making decisions on how to interact with fictional town characters. They can push characters away or pull them closer based on attributes of affiliation and relative power, effectively shaping relationships in an abstract social space framed by these two attributes. This study aims to examine how age influences a participant's tendency to push characters away from oneself– a measure of socially isolating behavior.

Methods: This cross-sectional study analyzed 890 participants who completed the task online (original sample: 629, validation sample: 261). Three factors ("social anxiety," "compulsivity," and "mood") were computed using a factor analysis of mental-health questionnaires from a post-task survey. Socially isolating behavior in the task was measured using the average vector length between a participant's viewpoint and characters' final coordinates in the abstract social space. COVID-19 stringency scores from the OxCGRT database were also considered. Multivariable models were created to explore the relationship between age and these and other task variables, while controlling for relevant covariates.

Results: The analysis showed a significant association between age and heightened socially isolating behavior in the task, irrespective of the aforementioned factors. These results were consistently replicated in an independent sample and remained statistically significant after accounting for the severity of COVID-19 restrictions. Moreover, our investigation revealed that while both age and factors related to social anxiety and mood correlated positively with increased distancing behavior in the task, only age significantly correlated with participants' subjective perception of their own distancing behavior, as assessed through post-task reflections.

Conclusion: The study indicates that as participants age, they may exhibit changes in social behavior which lead to increased social isolation. Additional research is needed to explore the neural mechanisms responsible for these behavioral shifts and gain a deeper understanding of the underlying processes.

"If we don't speak the language, we aren't offered the same opportunities." Qualitative Perspectives of Early Palliative Care Coordination for Women of Color Living with Advanced Breast Cancer

Nithya Krishnamurthy, Cardinale B. Smith, Jenny J. Lin, James Nicholas Dionne-Odom, Melissa Mazor
Icahn School of Medicine at Mount Sinai, Brookdale Department of Geriatrics and Palliative Medicine, NY, NY

"If we don't speak the language, we aren't offered the same opportunities."

Qualitative Perspectives of Early Palliative Care Coordination for Women of Color Living with Advanced Breast Cancer

Nithya Krishnamurthy, Cardinale B. Smith, Jenny J. Lin, James Nicholas Dionne-Odom, Melissa Mazor

INTRODUCTION

- Black and Latina women with advanced breast cancer experience more severe distress and symptom burden, discordant provider communication, and increased suffering relative to white women.
- Adequate care coordination can mitigate disparities in cancer care access and outcomes, yet little is known regarding early palliative care (PC) coordination experiences in women living with advanced breast cancer.

METHODS

- Semi-structured qualitative interviews with Black and Latina women with advanced breast cancer (N=20) and interdisciplinary care providers (N=20).
- Participants from urban PC and oncology clinics and community organizations.
- Themes were identified with inductive coding and thematic analysis.

RESULTS

Table 1: Characteristics of Providers and Patients

Provider Characteristics (N=20)		
Age (mean (SD))		49.5 (2.1)
Race/Ethnicity	Black/Non-Latina	35%
	White/Non-Latina	55%
	Latina/White	10%
Professional Role	Navigator	45%
	Social Worker	20%
	Nurse	15%
	Other*	25%
Patient Characteristics (N=20)		
Age (mean (SD))		61.8 (10.1)
	Stage III B/C	44%
	Stage IV BC	56%
Race/Ethnicity	Black	70%
	Latina	30%
College Graduate		45%

*Other=Medical Oncologists (n=2), PC Physicians (n=2), Chaplain (n=1)

Care coordination and patient reported palliative care outcomes are **heavily influenced by social determinants of health and stigma surrounding palliative care.** Barriers to quality palliative care coordination resulted in significant gaps in management of symptoms including **mental health, lymphedema, sexual health, cognitive health, and pain.**

Cultural stigma towards sexual and mental health topics
"there's an incredible deference paid to the doctors and staff, and I think it could be to a detriment, and even in terms of gathering information from the patient...How many times did somebody come and talk to me about what was going to be like to have sex or the sexual issues?"

Patient (PTID 159)

Lack of understanding about the scope and role of PC
"One patients don't know to ask for us, so I think they can't advocate, and I think there's still a lack of understanding on the primary oncology team' part of what we actually do I think there's still sort of a conception that we're mostly for end-of-life comfort only care."

Provider (SID 17)

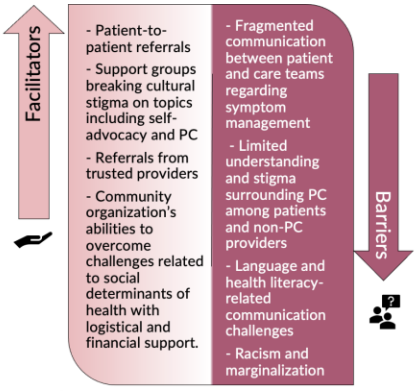
Implicit Bias
"Black women a lot of times. We don't get the help that we need, you know...because I really did feel like I wasn't being heard when I first, you know, was going to the emergency room. That was like why they keep sending me home like I know, with something. and I hate to blame it on race, but I just sometimes you can't help but to see it."

Patient (PTID 112)

Support groups encourage self-advocacy
"women to women... a patient support group...those often generate self referrals or patients, going back to the oncologist and saying you know really having a horrible [neuropathy] for my therapy for my breast cancer, I heard this talk at a support group meeting would you refer me i'd like to see if they can help me."

Provider Provider (SID 11)

Figure 1. Key facilitators and barriers to palliative care coordination



- **Barriers:**
  - Stigma, fragmented communication, and health literacy barriers posed unique challenges to nuanced discussions regarding prognosis in the advanced cancer setting.
  - Racism, marginalization, & implicit bias highlight the need for representation in PC workforce.
- **Facilitators:**
  - Patients and providers value representative support groups, timely referrals from trusted providers and peers, and community organizations in improving PC coordination and early access.

DISCUSSION

- Diverse social networks, community linkage and trust may be able to mitigate PC barriers related to social determinants of health and stigma.
- Findings will inform development of ACCESS, a navigator-led PC intervention for Black and Latina women with advanced breast cancer focusing on acceptance of early PC and linkage to community and clinical resources.

DISCLOSURES
Funding: K08CA267309, Hillman Foundation, MSTAR grant 5T35AG067578

"Care coordination and patient reported palliative care outcomes are heavily influenced by social determinants of health and stigma surrounding palliative care. Barriers to quality palliative care coordination resulted in significant gaps in management of symptoms including mental health, lymphedema, sexual health, cognitive health, and pain."

"If we don't speak the language, we aren't offered the same opportunities" – QUALITATIVE PERSPECTIVES OF PALLIATIVE CARE COORDINATION FOR WOMEN OF COLOR LIVING WITH METASTATIC BREAST CANCER

Nithya Krishnamurthy, Cardinale B. Smith, Jenny J. Lin, James Nicholas Dionne-Odom, Melissa Mazor

Background: Black and Latina women with advanced breast cancer experience more severe distress, unaddressed symptom burden, discordant provider communication and increased suffering relative to white women. Adequate palliative care coordination between providers and patients has the potential to mitigate disparities in care access and outcomes, yet little is known regarding palliative care (PC) coordination experiences in women living with metastatic disease.

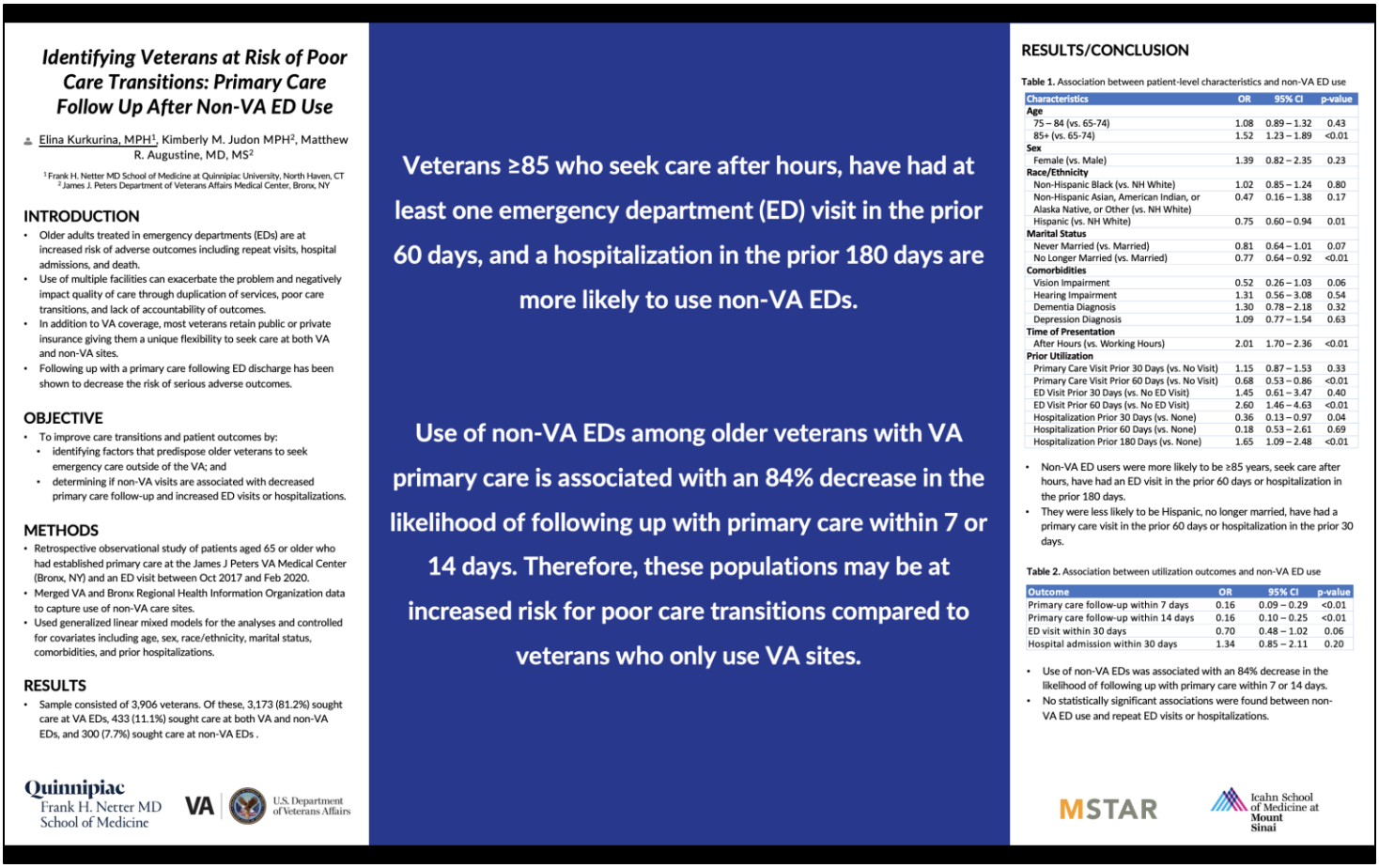
Methods: We conducted a qualitative thematic analysis of transcribed interviews of Black and Latina women with advanced breast cancer (N=20) and interdisciplinary care providers (N=20). Participants were recruited from urban palliative care (PC) and oncology clinics, federally qualified health centers, and community organizations. Transcripts were reviewed and analyzed by a team of investigators, community scientists and community advisory board members. Themes were identified with inductive coding.

Results: We identified key themes surrounding barriers and facilitators of PC coordination. Themes regarding barriers included 1) a lack of communication between patient and care teams regarding management of psychosocial and physical symptoms, encompassing 1a) cultural stigma towards sexual and mental health topics and 1b) care team coordination challenges, 2) limited understanding and stigma surrounding PC among patients and non-PC providers, 3) language and health literacy-related communication challenges, and 4) racism and marginalization, including 4a) implicit bias and 4b) lack of diverse racial/ethnic representation in the supportive care workforce. Facilitators of PC coordination included 5) patient-to-patient referrals, 6) support groups breaking cultural stigma on topics including self-advocacy and PC, 7) referrals from trusted providers, and 8) community organization's abilities to overcome challenges related to social determinants of health most specifically logistical and financial support. Respondents reported barriers of quality PC coordination resulted in significant gaps in management of psychosocial and physical symptoms associated with advanced breast cancer, including mental health, lymphedema, sexual health, cognitive health, and pain.

Conclusion: Care coordination and patient reported PC outcomes are heavily influenced by social determinants of health and stigma surrounding PC. Patients and providers value patient-to-patient referrals, support groups, and community organizations in improving care coordination and early PC access. The results from this study will inform the design of ACCESS, a community navigator-led PC intervention for Black and Latina women with advanced breast cancer focusing on acceptance of early PC and linkage to community and clinical resources.

Identifying Veterans at Risk of Poor Care Transitions: Primary Care Follow Up After Non-VA ED Use

Elina Kurkurina MPH, Kimberly M. Judon MPH, Matthew R. Augustine MD MS
Frank H. Netter MD School of Medicine at Quinnipiac University, North Haven, CT; James J. Peters Department of Veterans Affairs Medical Center, Bronx, NY; Icahn School of Medicine at Mount Sinai



Identifying Veterans at Risk of Poor Care Transitions: Primary Care Follow Up After Non-VA ED Use

Elina Kurkurina, MPH[1], Kimberly M. Judon MPH[2], Matthew R. Augustine, MD, MS[2]

[1] Frank H. Netter MD School of Medicine at Quinnipiac University, North Haven, CT
[2] James J. Peters Department of Veterans Affairs Medical Center, Bronx, NY

INTRODUCTION

- Older adults treated in emergency departments (EDs) are at increased risk of adverse outcomes including repeat visits, hospital admissions, and death.
- Use of multiple facilities can exacerbate the problem and negatively impact quality of care through duplication of services, poor care transitions, and lack of accountability of outcomes.
- In addition to VA coverage, most veterans retain public or private insurance giving them a unique flexibility to seek care at both VA and non-VA sites.
- Following up with a primary care following ED discharge has been shown to decrease the risk of serious adverse outcomes.

OBJECTIVE

- To improve care transitions and patient outcomes by:
  - identifying factors that predispose older veterans to seek emergency care outside of the VA; and
  - determining if non-VA visits are associated with decreased primary care follow-up and increased ED visits or hospitalizations.

METHODS

- Retrospective observational study of patients aged 65 or older who had established primary care at the James J Peters VA Medical Center (Bronx, NY) and an ED visit between Oct 2017 and Feb 2020.
- Merged VA and Bronx Regional Health Information Organization data to capture use of non-VA care sites.
- Used generalized linear mixed models for the analyses and controlled for covariates including age, sex, race/ethnicity, marital status, comorbidities, and prior hospitalizations.

RESULTS

- Sample consisted of 3,906 veterans. Of these, 3,173 (81.2%) sought care at VA EDs, 433 (11.1%) sought care at both VA and non-VA EDs, and 300 (7.7%) sought care at non-VA EDs .

Quinnipiac Frank H. Netter MD School of Medicine | VA U.S. Department of Veterans Affairs

Veterans ≥85 who seek care after hours, have had at least one emergency department (ED) visit in the prior 60 days, and a hospitalization in the prior 180 days are more likely to use non-VA EDs.

Use of non-VA EDs among older veterans with VA primary care is associated with an 84% decrease in the likelihood of following up with primary care within 7 or 14 days. Therefore, these populations may be at increased risk for poor care transitions compared to veterans who only use VA sites.

RESULTS/CONCLUSION

Table 1. Association between patient-level characteristics and non-VA ED use

Characteristics	OR	95% CI	p-value
Age			
75 – 84 (vs. 65-74)	1.08	0.89 – 1.32	0.43
85+ (vs. 65-74)	1.52	1.23 – 1.89	<0.01
Sex			
Female (vs. Male)	1.39	0.82 – 2.35	0.23
Race/Ethnicity			
Non-Hispanic Black (vs. NH White)	1.02	0.85 – 1.24	0.80
Non-Hispanic Asian, American Indian, or Alaska Native, or Other (vs. NH White)	0.47	0.16 – 1.38	0.17
Hispanic (vs. NH White)	0.75	0.60 – 0.94	0.01
Marital Status			
Never Married (vs. Married)	0.81	0.64 – 1.01	0.07
No Longer Married (vs. Married)	0.77	0.64 – 0.92	<0.01
Comorbidities			
Vision Impairment	0.52	0.26 – 1.03	0.06
Hearing Impairment	1.31	0.56 – 3.08	0.54
Dementia Diagnosis	1.30	0.78 – 2.18	0.32
Depression Diagnosis	1.09	0.77 – 1.54	0.63
Time of Presentation			
After Hours (vs. Working Hours)	2.01	1.70 – 2.36	<0.01
Prior Utilization			
Primary Care Visit Prior 30 Days (vs. No Visit)	1.15	0.87 – 1.53	0.33
Primary Care Visit Prior 60 Days (vs. No Visit)	0.68	0.53 – 0.86	<0.01
ED Visit Prior 30 Days (vs. No ED Visit)	1.45	0.61 – 3.47	0.40
ED Visit Prior 60 Days (vs. No ED Visit)	2.60	1.46 – 4.63	<0.01
Hospitalization Prior 30 Days (vs. None)	0.36	0.13 – 0.97	0.04
Hospitalization Prior 60 Days (vs. None)	0.18	0.53 – 2.61	0.69
Hospitalization Prior 180 Days (vs. None)	1.65	1.09 – 2.48	<0.01

- Non-VA ED users were more likely to be ≥85 years, seek care after hours, have had an ED visit in the prior 60 days or hospitalization in the prior 180 days.
- They were less likely to be Hispanic, no longer married, have had a primary care visit in the prior 60 days or hospitalization in the prior 30 days.

Table 2. Association between utilization outcomes and non-VA ED use

Outcome	OR	95% CI	p-value
Primary care follow-up within 7 days	0.16	0.09 – 0.29	<0.01
Primary care follow-up within 14 days	0.16	0.10 – 0.25	<0.01
ED visit within 30 days	0.70	0.48 – 1.02	0.06
Hospital admission within 30 days	1.34	0.85 – 2.11	0.20

- Use of non-VA EDs was associated with an 84% decrease in the likelihood of following up with primary care within 7 or 14 days.
- No statistically significant associations were found between non-VA ED use and repeat ED visits or hospitalizations.

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"Veterans ≥85 who seek care after hours, have had at least one emergency department (ED) visit in the prior 60 days, and a hospitalization in the prior 180 days are more likely to use non-VA EDs."

IDENTIFYING VETERANS AT RISK OF POOR CARE TRANSITIONS: PRIMARY CARE FOLLOW UP AFTER NON-VA ED USE

Elina Kurkurina MPH, Kimberly M. Judon MPH, Matthew R. Augustine MD MS

Background: Older adults treated in emergency departments (EDs) are at increased risk of adverse outcomes including repeat visits, hospital admissions, and death. Use of multiple facilities can exacerbate the problem and negatively impact quality of care through duplication of services and poor care transitions. Following up with primary care after discharge has been shown to decrease the risk of serious adverse outcomes. In addition to VA coverage, most veterans retain public or private insurance giving them a unique flexibility to seek care at both VA and non-VA sites. To improve care transitions and patient outcomes, it is important to identify factors that predispose older veterans to seek emergency care outside of the VA and determine if non-VA visits are associated with decreased primary care follow-up and increased ED visits or hospitalizations.

Methods: We conducted a retrospective, observational study of patients aged 65 or older who had established primary care at the James J Peters VA Medical Center (Bronx, NY) and an ED visit between October 2017 and February 2020. To capture non-VA ED use, we merged VA and Bronx Regional Health Information Organization data. We used generalized linear mixed models for the analyses and controlled for covariates including age, sex, race/ethnicity, marital status, comorbidities, and prior hospitalizations.

Results: Our sample consisted of 3,906 veterans. Of these, 81.2% sought emergency care at the VA, 7.7% outside of the VA, and 11.1% at both VA and non-VA sites. Non-VA ED users were more likely to be 85 years old or older (OR 1.52, CI 1.23-1.89), seek care after hours (OR 2.01, CI 1.70 – 2.36), have had an ED visit in the prior 60 days (OR 2.60, CI 1.46 – 4.63) or hospitalization in the prior 180 days (OR 1.65, 1.09 – 2.48). They were less likely to be Hispanic (OR 0.75, CI 0.60 – 0.94), no longer married (OR 0.77, CI 0.64 – 0.92), have had a primary care visit in the prior 60 days (OR 0.68, CI 0.53 – 0.86) or hospitalization in the prior 30 days (OR 0.36, CI 0.13 – 0.97). Use of non-VA EDs was associated with an 84% decrease in the likelihood of following up with primary care within 7 (OR 0.16, CI 0.09 – 0.29) or 14 days (OR 0.16, CI 0.10 – 0.25). No statistically significant associations were found between non-VA ED use and repeat ED visits or hospitalizations.

Conclusion: Use of non-VA EDs among older veterans with VA primary care is associated with a decreased likelihood of following up with primary care. Veterans who are 85 or older, seeking care after hours, with at least one ED visit in the prior 60 days, and a hospitalization in the prior 180 days are more likely to use non-VA EDs and therefore may be at an increased risk for poor care transitions compared to veterans who exclusively use VA facilities.

Development of a Deep Learning Algorithm to Automate the Segmentation of Spinal Cord from EOS Radiographic Images

Yash Lahoti MSE, Wasil Ahmed BS, Rami Rajjoub BS, Samuel Cho MD and Jun Kim MD
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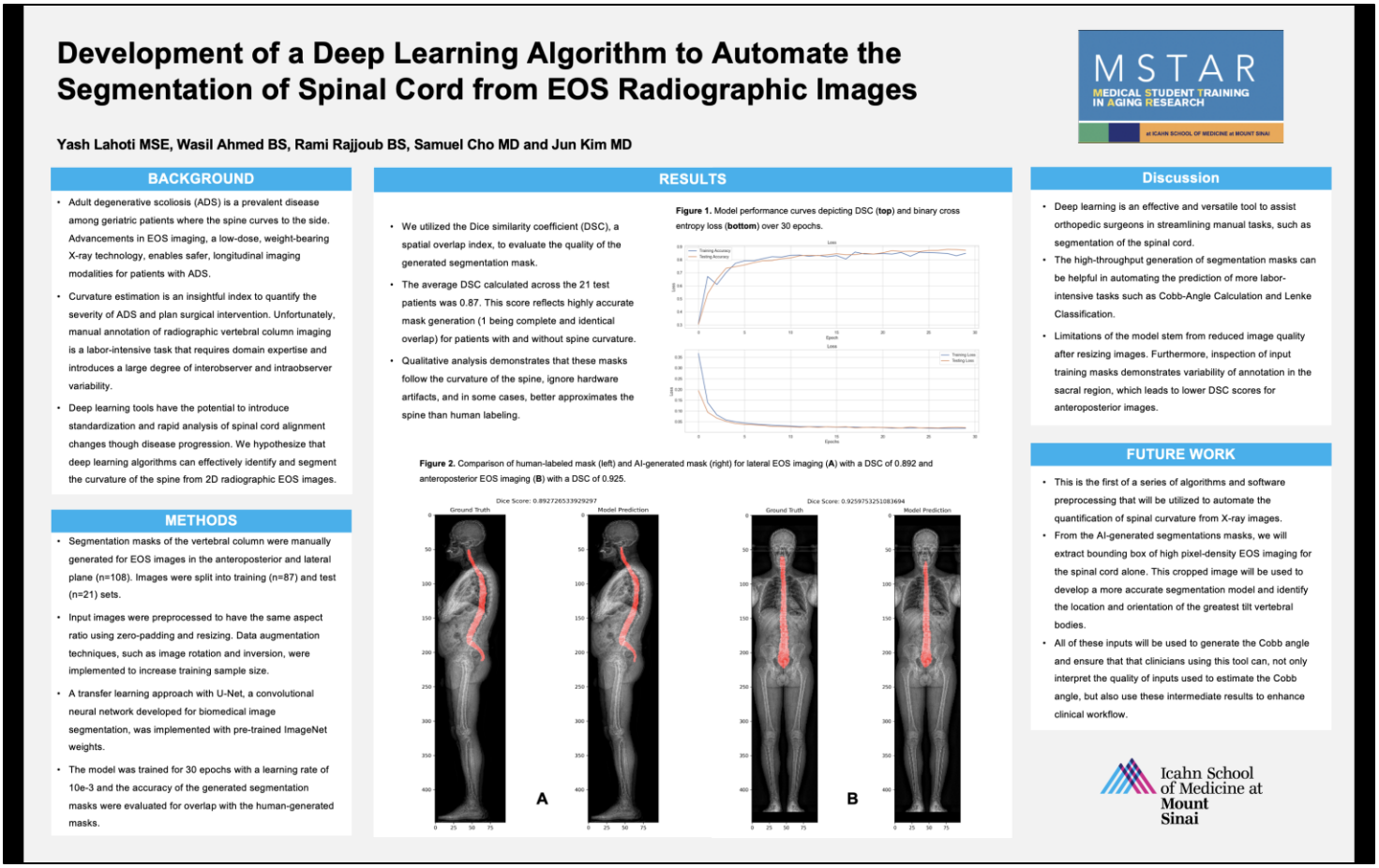

Development of a Deep Learning Algorithm to Automate the Segmentation of Spinal Cord from EOS Radiographic Images

Yash Lahoti MSE, Wasil Ahmed BS, Rami Rajjoub BS, Samuel Cho MD and Jun Kim MD

MSTAR MEDICAL STUDENT TRAINING IN AGING RESEARCH at ICAHN SCHOOL OF MEDICINE at MOUNT SINAI

BACKGROUND

- Adult degenerative scoliosis (ADS) is a prevalent disease among geriatric patients where the spine curves to the side. Advancements in EOS imaging, a low-dose, weight-bearing X-ray technology, enables safer, longitudinal imaging modalities for patients with ADS.
- Curvature estimation is an insightful index to quantify the severity of ADS and plan surgical intervention. Unfortunately, manual annotation of radiographic vertebral column imaging is a labor-intensive task that requires domain expertise and introduces a large degree of interobserver and intraobserver variability.
- Deep learning tools have the potential to introduce standardization and rapid analysis of spinal cord alignment changes though disease progression. We hypothesize that deep learning algorithms can effectively identify and segment the curvature of the spine from 2D radiographic EOS images.

METHODS

- Segmentation masks of the vertebral column were manually generated for EOS images in the anteroposterior and lateral plane (n=108). Images were split into training (n=87) and test (n=21) sets.
- Input images were preprocessed to have the same aspect ratio using zero-padding and resizing. Data augmentation techniques, such as image rotation and inversion, were implemented to increase training sample size.
- A transfer learning approach with U-Net, a convolutional neural network developed for biomedical image segmentation, was implemented with pre-trained ImageNet weights.
- The model was trained for 30 epochs with a learning rate of 10e-3 and the accuracy of the generated segmentation masks were evaluated for overlap with the human-generated masks.

RESULTS

- We utilized the Dice similarity coefficient (DSC), a spatial overlap index, to evaluate the quality of the generated segmentation mask.
- The average DSC calculated across the 21 test patients was 0.87. This score reflects highly accurate mask generation (1 being complete and identical overlap) for patients with and without spine curvature.
- Qualitative analysis demonstrates that these masks follow the curvature of the spine, ignore hardware artifacts, and in some cases, better approximates the spine than human labeling.

Figure 1. Model performance curves depicting DSC (**top**) and binary cross entropy loss (**bottom**) over 30 epochs.

Figure 2. Comparison of human-labeled mask (left) and AI-generated mask (right) for lateral EOS imaging (**A**) with a DSC of 0.892 and anteroposterior EOS imaging (**B**) with a DSC of 0.925.

Dice Score: 0.892726533929297 — Ground Truth — Model Prediction — A

Dice Score: 0.9259753251083694 — Ground Truth — Model Prediction — B

Discussion

- Deep learning is an effective and versatile tool to assist orthopedic surgeons in streamlining manual tasks, such as segmentation of the spinal cord.
- The high-throughput generation of segmentation masks can be helpful in automating the prediction of more labor-intensive tasks such as Cobb-Angle Calculation and Lenke Classification.
- Limitations of the model stem from reduced image quality after resizing images. Furthermore, inspection of input training masks demonstrates variability of annotation in the sacral region, which leads to lower DSC scores for anteroposterior images.

FUTURE WORK

- This is the first of a series of algorithms and software preprocessing that will be utilized to automate the quantification of spinal curvature from X-ray images.
- From the AI-generated segmentations masks, we will extract bounding box of high pixel-density EOS imaging for the spinal cord alone. This cropped image will be used to develop a more accurate segmentation model and identify the location and orientation of the greatest tilt vertebral bodies.
- All of these inputs will be used to generate the Cobb angle and ensure that that clinicians using this tool can, not only interpret the quality of inputs used to estimate the Cobb angle, but also use these intermediate results to enhance clinical workflow.

Icahn School of Medicine at Mount Sinai

"Deep learning tools have the potential to introduce standardization and rapid analysis of spinal cord alignment changes though disease progression. We hypothesize that deep learning algorithms can effectively identify and segment the curvature of the spine from 2D radiographic EOS images."

DEVELOPMENT OF A DEEP LEARNING ALGORITHM TO AUTOMATE THE SEGMENTATION OF SPINAL CORD FROM EOS RADIOGRAPHIC IMAGES

Yash Lahoti, MSE, Samuel K. Cho, MD, Jun S. Kim, MD

Introduction: Adult degenerative scoliosis (ADS) is a prevalent disease among geriatric patients where the spine curves to the side. Advancements in EOS imaging, a low-dose, weight-bearing X-ray technology, enables safer, longitudinal imaging modalities for patients with ADS. Curvature estimation is an insightful index to quantify the severity of ADS and plan surgical intervention. Unfortunately, manual annotation of radiographic vertebral column imaging is a labor-intensive task that requires domain expertise and introduces a large degree of interobserver and intraobserver variability. Deep learning tools have the potential to introduce standardization and rapid analysis of spinal cord alignment changes though disease progression. We hypothesize that deep learning algorithms can effectively identify and segment the curvature of the spine from 2D radiographic EOS images.

Methods: Segmentation masks of the vertebral column were manually generated for each image. Images were split into training (n=89) and test (n=22) sets. Input images were preprocessed using contrast limited adaptive histogram equalization (CLAHE) to standardize inputs and improve contrast of the spine. Data augmentation techniques, such as image rotation and inversion, were implemented to increase training sample size. A transfer learning approach was used by fine tuning a pre-trained convolutional neural network (CNN) used for segmentation, ResNet-50, onto the radiographic data set. The model was trained for 25 epochs with a learning rate of 10e-3 and the accuracy of the generated segmentation masks were evaluated for overlap with the labels.

Results: We utilized the Dice similarity coefficient (DSC), a spatial overlap index, to evaluate the quality of the generated segmentation mask. The average DSC calculated across the 22 test patients was 0.86. This score reflects highly accurate mask generation (1 being complete and identical overlap). Qualitative analysis demonstrates that these masks follow the curvature of the spine, and in some cases, better approximates the spine than human labeling.

Discussion: Deep learning is an effective and versatile tool to assist orthopedic surgeons in streamlining manual tasks such as segmentation of the spinal cord. The high-throughput generation of segmentation masks can be helpful in automating the prediction of more labor-intensive tasks such as Cobb-Angle Calculation and Lenke Classification.

Associations Between Cognitive Ability and Changes in Quality of Life Among Older Adults with Metastatic Cancer Undergoing Palliative Radiation Therapy

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Associations Between Cognitive Ability and Changes in Quality of Life Among Older Adults with Metastatic Cancer Undergoing Palliative Radiation Therapy

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INTRODUCTION

- Cognitive impairment is a disease of aging and can be associated with cancer and cancer treatment.
- Little is understood concerning how geriatric conditions are associated with various outcomes from radiation therapy (RT).
- A gap in knowledge exists around associations between cognitive ability and quality of life after RT in older adults

OBJECTIVE

- To estimate associations between pre-RT cognitive ability and one-month post-RT quality of life changes in older adults with metastatic disease.

METHODS

- Prospective cohort study of patients aged ≥65 with metastatic disease receiving radiation treatment at a single academic medical center in the Northeast
- Cognitive ability assessed through the BOMC with scores of ≥ 10 indicating signs of cognitive impairment and scores < 10 considered without impairment
- Quality of life assessed through the EORTC-QLQ-30 scale
- 8 EORTC subscales of QOL analyzed with linear mixed methods modeling

RESULTS

- Accessed survey data from 19 enrolled patients. 16 in the unimpaired group and 3 in the impaired group.
- Appetite worsened significantly more over time for those with cognitive impairment compared to those without impairment (p=0.0200).
- Financial difficulties worsened significantly over time for those with cognitive impairment compared to those without impairment (p=0.0028).
- Social functioning improved significantly (p=0.0293) one month following radiation therapy for the unimpaired cognitive status group, but the mean difference between the two groups was not significant
- Role functioning improved significantly (p=0.0483) for the unimpaired cognitive status group, yet we did not find a statistically significant mean difference between the two groups.

Appetite and financial difficulties worsen significantly after radiation therapy for those with cognitive impairment.

Figure 1

Table 2. Results

Scale	Cognition	Mean PreRT ± SE	Mean PostRT ± SE	Change Score (PostRT-PreRT)	P-value	Mean Difference between Change Scores (95% Confidence Interval)	P-value
EORTC Global Health Status	Unimpaired (N=16)	58.33 ± 6.24	65.48 ± 5.9	7.14 [-1.19, 15.48]	0.0869	-12.09 [-11.32, 35.49]	0.2867
	Impaired (N=3)	52.78 ± 14.42	47.84 ± 14.51	-4.94 [-26.81, 16.93]	0.6316	Reference	
EORTC Cognitive Functioning	Unimpaired (N=16)	81.25 ± 5.93	81.1 ± 6.63	-0.15 [-8.01, 8.71]	0.9714	0.19 [-15.91, 16.28]	0.9881
	Impaired (N=3)	77.78 ± 13.69	77.44 ± 16.58	-0.34 [-24.88, 24.21]	0.9770	Reference	
EORTC Emotional Functioning	Unimpaired (N=16)	81.25 ± 6.18	84.81 ± 6.2	3.56 [-4, 13.11]	0.4405	5.81 [-21.73, 33.61]	0.6572
	Impaired (N=3)	72.22 ± 14.28	69.87 ± 15.73	-2.35 [-28.35, 23.65]	0.8507	Reference	
EORTC Physical Functioning	Unimpaired (N=16)	70.42 ± 6.4	71.95 ± 4.94	1.53 [-5.84, 8.91]	0.6646	10.99 [-9.37, 31.35]	0.2712
	Impaired (N=3)	62.22 ± 14.78	51.77 ± 12.14	-9.45 [-28.44, 9.53]	0.3093	Reference	
EORTC Social Functioning	Unimpaired (N=16)	65.63 ± 9.95	86.27 ± 5.99	20.65 [2.95, 38.35]	0.0295	-2.26 [-50.8, 46.29]	0.9230
	Impaired (N=3)	66.67 ± 23.98	89.57 ± 16.04	22.9 [-22.09, 67.89]	0.2979	Reference	
EORTC Role Functioning	Unimpaired (N=16)	56.25 ± 8.83	72.28 ± 8.89	16.03 [0.13, 31.93]	0.0483	28.78 [-16.93, 74.49]	0.2010
	Impaired (N=3)	88.89 ± 20.4	76.14 ± 23.1	-12.75 [-55.62, 30.12]	0.5378	Reference	
EORTC Appetite Loss	Unimpaired (N=16)	10.42 ± 6.42	8.64 ± 6.21	-1.78 [-13.29, 9.73]	0.7417	37.64 [-68.56, -6.72]	0.0200
	Impaired (N=3)	55.56 ± 16.84	91.41 ± 11.19	35.86 [7.11, 64.56]	0.0179	Reference	
EORTC Financial Difficulties	Unimpaired (N=16)	6.25 ± 5.87	6.25 ± 6.08	0 [-3.36, 3.36]	1.0000	-16.67 [-26.6, -6.73]	0.0028
	Impaired (N=3)	0 ± 13.16	16.67 ± 14.25	16.67 [-7.32, 16.02]	0.0017	Reference	

DISCUSSION

- Cognitive status may be associated with significantly different changes in appetite and financial strain.
- Role functioning and social functioning are two important aspects of QOL that significantly improve after radiation in people without cognitive impairment.
- Understanding cognitive ability in geriatric patients is likely important in caring holistically for older adults undergoing radiation treatment.
- Due to lack of power in this study, results are exploratory, and more work needs to be done to best understand associations between cognitive ability and quality of life in older adults undergoing radiation therapy.
- Further analysis will adjust for covariates such as age between cognitive status groups.

Table 1. Patient Characteristics

	Unimpaired (N=16)	Impaired (N=3)	Total (N=19)	P-value
Age				0.1613
Mean (SD)	75.6 (7.01)	70.0 (7.93)	74.7 (7.13)	
Median (IQR)	73.5 (70.5, 81.0)	67.0 (65.0, 78.0)	72.0 (69.0, 80.0)	
EORTC Appetite Loss				0.0200
Mean (SD)	10.4 (20.07)	55.6 (30.92)	17.5 (30.19)	
Median (IQR)	0.0 (0.0, 16.7)	66.7 (0.0, 100.0)	0.0 (0.0, 33.3)	
EORTC Cognitive Functioning				0.9410
Mean (SD)	81.3 (25.00)	77.8 (9.62)	80.7 (23.08)	
Median (IQR)	83.3 (75.0, 100.0)	83.3 (66.7, 83.3)	83.3 (66.7, 100.0)	
EORTC Financial Difficulties				0.0028
Mean (SD)	6.3 (25.00)	0.0 (0.00)	5.3 (22.94)	
Median (IQR)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	
EORTC Physical Functioning				0.4298
Mean (SD)	70.4 (25.67)	62.2 (22.47)	69.1 (25.05)	
Median (IQR)	75.0 (59.0, 86.7)	60.0 (45.0, 86.7)	86.7 (45.7, 93.3)	
EORTC Global Health Status				0.6113
Mean (SD)	58.3 (21.04)	52.8 (41.11)	57.5 (24.26)	
Median (IQR)	62.5 (50.0, 70.8)	33.3 (25.0, 100.0)	58.3 (41.7, 75.0)	
EORTC Role Functioning				0.1304
Mean (SD)	86.3 (36.99)	88.9 (19.25)	87.4 (35.45)	
Median (IQR)	66.7 (25.0, 91.7)	100.0 (66.7, 100.0)	66.7 (33.3, 100.0)	
EORTC Social Functioning				0.6027
Mean (SD)	65.6 (36.75)	66.7 (57.74)	65.8 (38.68)	
Median (IQR)	75.0 (50.0, 100.0)	100.0 (0.0, 100.0)	83.3 (50.0, 100.0)	
Race, n (%)				0.2649
Asian	1 (6.3%)	1 (33.3%)	2 (10.5%)	
Black or African American	3 (18.8%)	1 (33.3%)	4 (21.1%)	
White	12 (75.0%)	1 (33.3%)	13 (68.4%)	
Ethnicity, n (%)				0.9007
Hispanic or Latino	3 (18.8%)	1 (33.3%)	4 (21.1%)	
NOT Hispanic or Latino	13 (81.3%)	2 (66.7%)	15 (78.9%)	
Karnofsky Performance Status, n (%)				0.7531
100%, Normal, no complaints, no symptoms of disease	1 (6.3%)	0 (0.0%)	1 (5.3%)	
90%, Able to carry on normal activity, minor symptoms of disease	6 (37.5%)	2 (66.7%)	8 (42.1%)	
80%, Normal activity with effort, some symptoms of disease	8 (50.0%)	1 (33.3%)	9 (47.4%)	
70%, Care for self, unable to carry on normal activity or to do active work	1 (6.3%)	0 (0.0%)	1 (5.3%)	

*Kruskal-Wallis p-value; †Chi-Square p-value.

MSTAR MEDICAL STUDENT TRAINING IN AGING RESEARCH

Icahn School of Medicine at Mount Sinai

FINANCIAL DISCLOSURE

- *This study was supported the National Institute for Aging (NIA) and the Medical Student Training in Aging Research (MSTAR) Program at the Icahn School of Medicine at Mount Sinai . The investigators retained full independence in the conduct of this research.*

"Appetite and financial difficulties worsen significantly after radiation therapy for those with cognitive impairment."

ASSOCIATIONS BETWEEN COGNITIVE ABILITY AND CHANGES IN QUALITY OF LIFE AMONG OLDER ADULTS WITH METASTATIC CANCER UNDERGOING PALLIATIVE RADIATION THERAPY

Amare Osei, Erin Moshier, MS2, Laura Jonsson, Kavita Dharmarajan, MD, MSc

Background: Cognitive impairment is a condition of aging and has been shown to be associated with cancer and cancer treatment. Older adults may be more susceptible to poor outcomes from radiation therapy, yet the relationship of geriatric conditions, particularly cognitive impairment, with outcomes after radiation such as quality of life is not well understood. The objective of this study is to estimate associations between pre-radiation therapy cognitive ability and one-month post-radiation quality of life changes in older adults with metastatic disease.

Methods: This is a prospective cohort study comprising patients aged 65 and older with metastatic cancer undergoing palliative radiation treatment at a large academic institution in the Northeast. This study is situated within a larger prospective cohort study that aims to improve outcomes of older adults undergoing radiation. Cognitive ability was assessed through the Blessed Orientation-Memory-Concentration Assessment (BOMC), a 6-question validated screening tool for signs of cognitive impairment. We assessed patient-reported quality of life through the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC-QLQ-30) at baseline before radiation and one-month post-radiation and the data was collected in RedCap. Linear mixed effects modeling was used to assess the differences in EORTC-QLQ-30 subscale change scores between pre- and post-radiation therapy assessments in patients grouped by cognitive status (unimpaired and impaired). Patient characteristics were compared using Fisher's exact test for categorical distributions and the Wilcoxon rank-sum test for continuous distributions.

Results: We accessed survey responses from 19 enrolled patients, 16 of whom were in the unimpaired group and 3 in the impaired group. Appetite worsened significantly more over time for those with cognitive impairment compared to those without impairment ($p=0.0200$), and financial difficulties worsened significantly over time for those with cognitive impairment ($p=0.0028$). Social functioning improved significantly ($p=0.0293$) one month following radiation for the unimpaired cognitive status group, but the mean difference between the two groups was not significant. Role functioning improved significantly ($p=0.0483$) for the unimpaired group, yet we did not find a statistically significant mean difference between the two groups.

Conclusions: Our preliminary data is demonstrating that financial burden and appetite significantly worsen within a month after radiation for individuals with cognitive impairment. Further analysis with a larger study population and adjusted multivariate analysis are necessary to further elucidate the relationship between cognitive ability and quality of life in older adults undergoing radiation therapy to eventually guide clinicians on best care practices for radiation patients with cognitive impairment.

The Impact of Frailty on Facial Nerve Recovery Following Bell's Palsy

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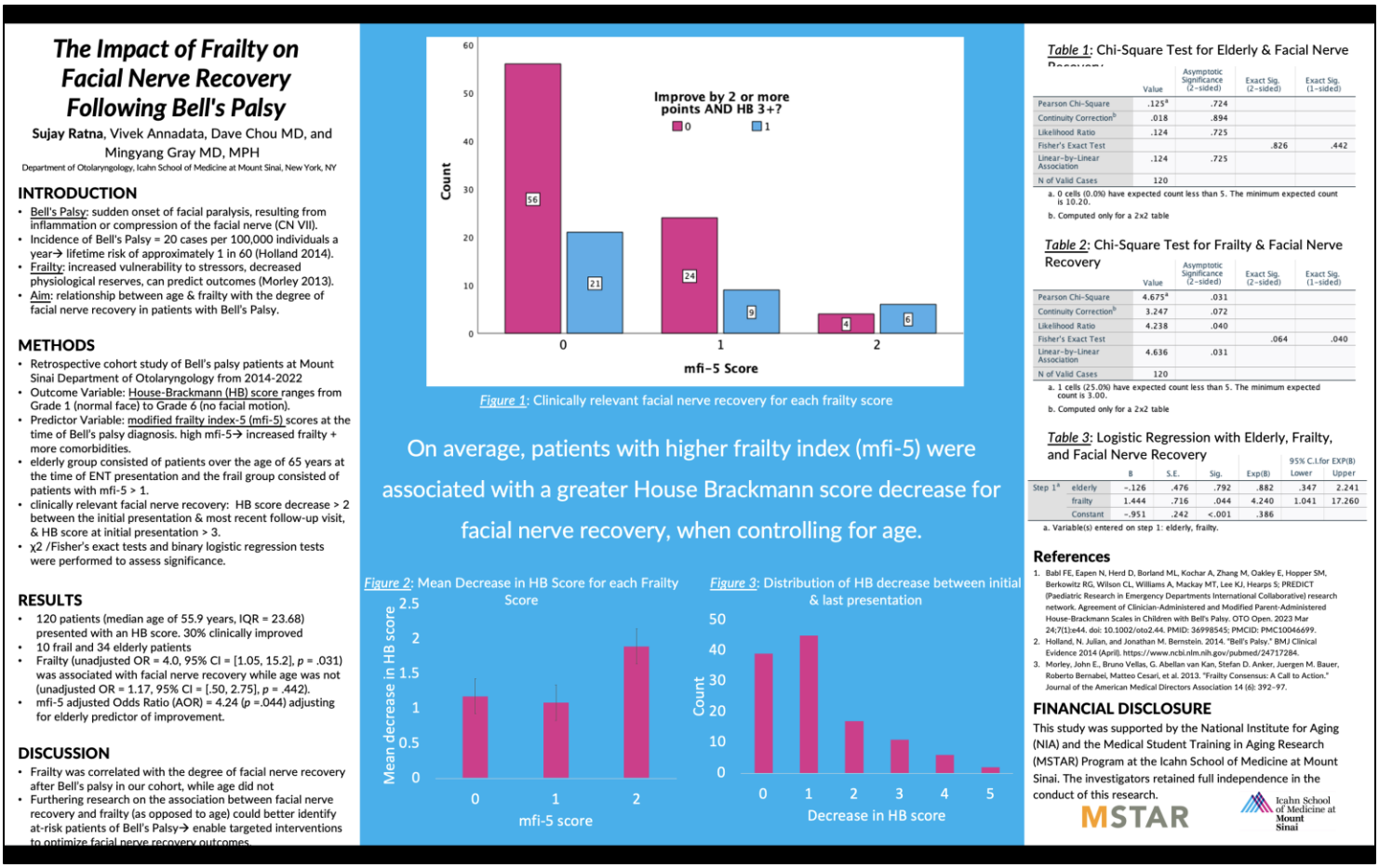

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INTRODUCTION

- Bell's Palsy: sudden onset of facial paralysis, resulting from inflammation or compression of the facial nerve (CN VII).
- Incidence of Bell's Palsy = 20 cases per 100,000 individuals a year→ lifetime risk of approximately 1 in 60 (Holland 2014).
- Frailty: increased vulnerability to stressors, decreased physiological reserves, can predict outcomes (Morley 2013).
- Aim: relationship between age & frailty with the degree of facial nerve recovery in patients with Bell's Palsy.

METHODS

- Retrospective cohort study of Bell's palsy patients at Mount Sinai Department of Otolaryngology from 2014-2022
- Outcome Variable: House-Brackmann (HB) score ranges from Grade 1 (normal face) to Grade 6 (no facial motion).
- Predictor Variable: modified frailty index-5 (mfi-5) scores at the time of Bell's palsy diagnosis. high mfi-5→ increased frailty + more comorbidities.
- elderly group consisted of patients over the age of 65 years at the time of ENT presentation and the frail group consisted of patients with mfi-5 > 1.
- clinically relevant facial nerve recovery: HB score decrease > 2 between the initial presentation & most recent follow-up visit, & HB score at initial presentation > 3.
- χ2 /Fisher's exact tests and binary logistic regression tests were performed to assess significance.

RESULTS

- 120 patients (median age of 55.9 years, IQR = 23.68) presented with an HB score. 30% clinically improved
- 10 frail and 34 elderly patients
- Frailty (unadjusted OR = 4.0, 95% CI = [1.05, 15.2], p = .031) was associated with facial nerve recovery while age was not (unadjusted OR = 1.17, 95% CI = [.50, 2.75], p = .442).
- mfi-5 adjusted Odds Ratio (AOR) = 4.24 (p =.044) adjusting for elderly predictor of improvement.

DISCUSSION

- Frailty was correlated with the degree of facial nerve recovery after Bell's palsy in our cohort, while age did not
- Furthering research on the association between facial nerve recovery and frailty (as opposed to age) could better identify at-risk patients of Bell's Palsy→ enable targeted interventions to optimize facial nerve recovery outcomes.

Figure 1: Clinically relevant facial nerve recovery for each frailty score

On average, patients with higher frailty index (mfi-5) were associated with a greater House Brackmann score decrease for facial nerve recovery, when controlling for age.

Figure 2: Mean Decrease in HB Score for each Frailty Score

Figure 3: Distribution of HB decrease between initial & last presentation

Table 1: Chi-Square Test for Elderly & Facial Nerve Recovery

	Value	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.125[a]	.724		
Continuity Correction[b]	.018	.894		
Likelihood Ratio	.124	.725		
Fisher's Exact Test			.826	.442
Linear-by-Linear Association	.124	.725		
N of Valid Cases	120			

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.20.
b. Computed only for a 2x2 table

Table 2: Chi-Square Test for Frailty & Facial Nerve Recovery

	Value	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.675[a]	.031		
Continuity Correction[b]	3.247	.072		
Likelihood Ratio	4.238	.040		
Fisher's Exact Test			.064	.040
Linear-by-Linear Association	4.636	.031		
N of Valid Cases	120			

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 3.00.
b. Computed only for a 2x2 table

Table 3: Logistic Regression with Elderly, Frailty, and Facial Nerve Recovery

		B	S.E.	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	elderly	-.126	.476	.792	.882	.347	2.241
	frailty	1.444	.716	.044	4.240	1.041	17.260
	Constant	-.951	.242	<.001	.386		

a. Variable(s) entered on step 1: elderly, frailty.

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FINANCIAL DISCLOSURE

This study was supported by the National Institute for Aging (NIA) and the Medical Student Training in Aging Research (MSTAR) Program at the Icahn School of Medicine at Mount Sinai. The investigators retained full independence in the conduct of this research.

MSTAR

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"On average, patients with higher frailty index (mfi-5) were associated with a greater House Brackmann score decrease for facial nerve recovery, when controlling for age."

THE IMPACT OF FRAILTY ON FACIAL NERVE RECOVERY FOLLOWING BELL'S PALSY

Sujay Ratna, Vivek Annadata, Dave Chou MD, and Mingyang Gray MD, MPH

Purpose: Bell's Palsy is characterized by the sudden onset of facial paralysis, resulting from inflammation or compression of the facial nerve (CN VII). The recovery from Bell's Palsy varies, with some experiencing complete resolution while others have a long-lasting or permanent facial weakness. The annual incidence of Bell's Palsy is approximately 20 cases per 100,000 individuals, corresponding to a lifetime risk of approximately 1 in 60 (Holland 2014). Frailty, a clinical syndrome characterized by decreased physiological reserves and increased vulnerability to stressors, has been recognized as an important factor in predicting outcomes and recovery in various health conditions (Walston 2013). However, the relationship between frailty and facial nerve recovery in individuals with Bell's Palsy remains unclear. Although myriad factors may influence an individual's recovery from Bell's Palsy, we aimed to examine the relationship between age and frailty with the degree of facial nerve recovery in patients with Bell's Palsy.

Methods: We retrospectively reviewed electronic medical records of patients with Bell's palsy who presented to the Department of Otolaryngology at Mount Sinai Hospital between 2014 and 2022. We recorded demographic data, medical history, and clinical notes. The outcome variable was the House-Brackmann (HB) score ranging from Grade 1 (normal face) to Grade 6 (no facial motion). Patients with no follow-up visits (81 patients) and initial HB scores of 1 (1 patient) were excluded. Frailty was the predictor variable measured by modified frailty index-5 (mfi-5) scores at the time of Bell's palsy diagnosis. A higher mfi-5 score signifies a frailer patient with more comorbidities. We created a binary variable by dichotomizing the data for the predictor and outcome variables. The elderly group consisted of patients over the age of 65 years at the time of ENT presentation and the frail group consisted of patients with an mfi-5 > 1. A clinically relevant facial nerve recovery was defined as an HB score decrease > 2 between the initial presentation & most recent follow-up visit, which requires an HB score at initial presentation > 3. Appropriate statistical methods were applied to conduct analysis using SPSS version 27.0. Chi-squared analyses and a binary logistic regression model were conducted to assess the association of elderly and frailty with facial nerve recovery.

Results: 202 total patients with Bell's palsy were identified in our single-center cohort . Among them, 120 patients (median age of 55.9 years, IQR = 23.68) presented with an HB score > 3 and were included in our analytic sample. 10 patients were classified as frail, and 34 patients were classified as elderly. 30% of patients' HB scores improved ≥ 2, a clinically significant difference indicating facial nerve recovery, on HB within the follow-up period. Frailty (unadjusted OR = 4.0, 95% CI = [1.05, 15.2], p = .031) was associated with facial nerve recovery while age was not (unadjusted OR = 1.17, 95% CI = [.50, 2.75], p = .442). The logistic regression showed that the mfi-5 adjusted Odds Ratio (AOR) = 4.24 (95% CI = [1.04, 17.2],, p =.044) adjusting for elderly predictor of improvement.

Conclusions: Frailty was correlated with increased facial nerve recovery after Bell's palsy in our cohort, while age did not have a significant association. Furthering research on the association between facial nerve recovery and frailty (as opposed to age) could help better identify at-risk patients of Bell's Palsy and therefore enable targeted interventions to optimize facial nerve recovery outcomes.

Association Between Primary Spoken Language and Hospital Readmissions Following Hip Fracture Diagnosis: A Retrospective Cohort Study

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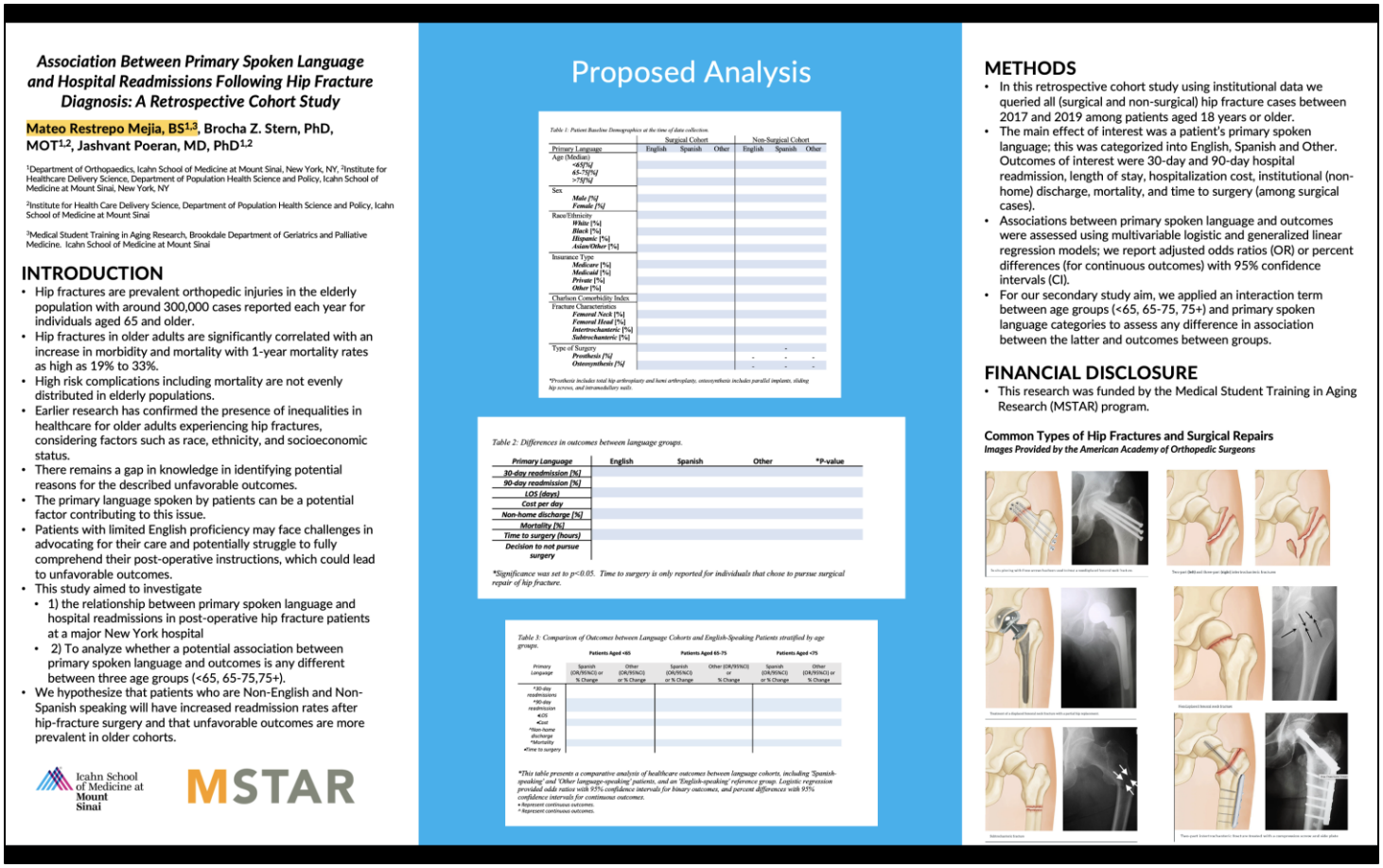

Association Between Primary Spoken Language and Hospital Readmissions Following Hip Fracture Diagnosis: A Retrospective Cohort Study

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INTRODUCTION

- Hip fractures are prevalent orthopedic injuries in the elderly population with around 300,000 cases reported each year for individuals aged 65 and older.
- Hip fractures in older adults are significantly correlated with an increase in morbidity and mortality with 1-year mortality rates as high as 19% to 33%.
- High risk complications including mortality are not evenly distributed in elderly populations.
- Earlier research has confirmed the presence of inequalities in healthcare for older adults experiencing hip fractures, considering factors such as race, ethnicity, and socioeconomic status.
- There remains a gap in knowledge in identifying potential reasons for the described unfavorable outcomes.
- The primary language spoken by patients can be a potential factor contributing to this issue.
- Patients with limited English proficiency may face challenges in advocating for their care and potentially struggle to fully comprehend their post-operative instructions, which could lead to unfavorable outcomes.
- This study aimed to investigate
  - 1) the relationship between primary spoken language and hospital readmissions in post-operative hip fracture patients at a major New York hospital
  - 2) To analyze whether a potential association between primary spoken language and outcomes is any different between three age groups (<65, 65-75,75+).
- We hypothesize that patients who are Non-English and Non-Spanish speaking will have increased readmission rates after hip-fracture surgery and that unfavorable outcomes are more prevalent in older cohorts.

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Proposed Analysis

Table 1: Patient Baseline Demographics at the time of data collection.

	Surgical Cohort			Non-Surgical Cohort		
Primary Language	English	Spanish	Other	English	Spanish	Other
Age (Median)						
<65[%]						
65-75[%]						
>75[%]						
Sex						
Male [%]						
Female [%]						
Race/Ethnicity						
White [%]						
Black [%]						
Hispanic [%]						
Asian/Other [%]						
Insurance Type						
Medicare [%]						
Medicaid [%]						
Private [%]						
Other [%]						
Charlson Comorbidity Index						
Fracture Characteristics						
Femoral Neck [%]						
Femoral Head [%]						
Intertrochanteric [%]						
Subtrochanteric [%]						
Type of Surgery						
Prosthesis [%]				-	-	-
Osteosynthesis [%]				-	-	-

*Prosthetic includes total hip arthroplasty and hemi arthroplasty, osteosynthesis includes parallel implants, sliding hip screws, and intramedullary nails.

Table 2: Differences in outcomes between language groups.

Primary Language	English	Spanish	Other	*P-value
30-day readmission [%]				
90-day readmission [%]				
LOS (days)				
Cost per day				
Non-home discharge [%]				
Mortality [%]				
Time to surgery (hours)				
Decision to not pursue surgery				

**Significance was set to p<0.05. Time to surgery is only reported for individuals that chose to pursue surgical repair of hip fracture.*

Table 3: Comparison of Outcomes between Language Cohorts and English-Speaking Patients stratified by age groups.

Primary Language	Patients Aged <65: Spanish (OR/95%CI) or % Change	Patients Aged <65: Other (OR/95%CI) or % Change	Patients Aged 65-75: Spanish (OR/95%CI) or % Change	Patients Aged 65-75: Other (OR/95%CI) or % Change	Patients Aged >75: Spanish (OR/95%CI) or % Change	Patients Aged >75: Other (OR/95%CI) or % Change
30-day readmission						
90-day readmission						
LOS						
Cost						
Non-home discharge						
Mortality						
Time to surgery						

**This table presents a comparative analysis of healthcare outcomes between language cohorts, including 'Spanish-speaking' and 'Other language-speaking' patients, and an 'English-speaking' reference group. Logistic regression provided odds ratios with 95% confidence intervals for binary outcomes, and percent differences with 95% confidence intervals for continuous outcomes.*
*Represent continuous outcomes.
*Represent continuous outcomes.

METHODS

- In this retrospective cohort study using institutional data we queried all (surgical and non-surgical) hip fracture cases between 2017 and 2019 among patients aged 18 years or older.
- The main effect of interest was a patient's primary spoken language; this was categorized into English, Spanish and Other. Outcomes of interest were 30-day and 90-day hospital readmission, length of stay, hospitalization cost, institutional (non-home) discharge, mortality, and time to surgery (among surgical cases).
- Associations between primary spoken language and outcomes were assessed using multivariable logistic and generalized linear regression models; we report adjusted odds ratios (OR) or percent differences (for continuous outcomes) with 95% confidence intervals (CI).
- For our secondary study aim, we applied an interaction term between age groups (<65, 65-75, 75+) and primary spoken language categories to assess any difference in association between the latter and outcomes between groups.

FINANCIAL DISCLOSURE

- This research was funded by the Medical Student Training in Aging Research (MSTAR) program.

Common Types of Hip Fractures and Surgical Repairs
Images Provided by the American Academy of Orthopedic Surgeons

"We hypothesize that patients who are Non-English and Non-Spanish speaking will have increased readmission rates after hip-fracture surgery and that unfavorable outcomes are more prevalent in older cohorts."

ASSOCIATION BETWEEN PRIMARY SPOKEN LANGUAGE AND HOSPITAL READMISSIONS FOLLOWING HIP FRACTURE DIAGNOSIS: A RETROSPECTIVE COHORT STUDY

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Background: Hip fractures are prevalent orthopedic injuries in the elderly population with around 300,000 cases reported each year for individuals aged 65 and older. Hip fractures in older adults are significantly correlated with an increase in morbidity and mortality with 1-year mortality rates as high as 19% to 33%. However, high risk complications including mortality are not evenly distributed in elderly populations. Earlier research has confirmed the presence of inequalities in healthcare for older adults experiencing hip fractures, taking into account factors such as race, ethnicity, and socioeconomic status. Non-white patients have been found to face increased mortality rates and decreased mobility compared to their white counterparts. Although these studies have identified these disparities, there remains a gap in knowledge in identifying potential reasons for the described unfavorable outcomes. The primary language spoken by patients can be a potential factor contributing to this issue. Patients with limited English proficiency may face challenges in advocating for their care and potentially struggle to fully comprehend their post-operative instructions, which could lead to unfavorable outcomes. This study aimed to investigate 1) the relationship between primary spoken language and hospital readmissions in post-operative hip fracture patients at a major New York hospital, and 2) To analyze whether a potential association between primary spoken language and outcomes is any different between three age groups (<65, 65-75,75+). We hypothesize that patients who are Non-English and Non-Spanish speaking will have increased readmission rates after hip-fracture surgery and that unfavorable outcomes are more prevalent in older cohorts.

Methods: In this retrospective cohort study using institutional data we queried all (surgical and non-surgical) hip fracture cases between 2017 and 2019 among patients aged 18 years or older. The main effect of interest was a patient's primary spoken language; this was categorized into English, Spanish and Other. Outcomes of interest were 30-day and 90-day hospital readmission, length of stay, hospitalization cost, institutional (non-home) discharge, mortality, and time to surgery (among surgical cases). Associations between primary spoken language and outcomes were assessed using multivariable logistic and generalized linear regression models; we report adjusted odds ratios (OR) or percent differences (for continuous outcomes) with 95% confidence intervals (CI). For our secondary study aim, we applied an interaction term between age groups (<65, 65-75, 75+) and primary spoken language categories to assess any difference in association between the latter and outcomes between groups.

This research work is still in progress. Results and Conclusion are pending.

Racial Disparities In The Emergency Department Among Patients With Serious Illnesses

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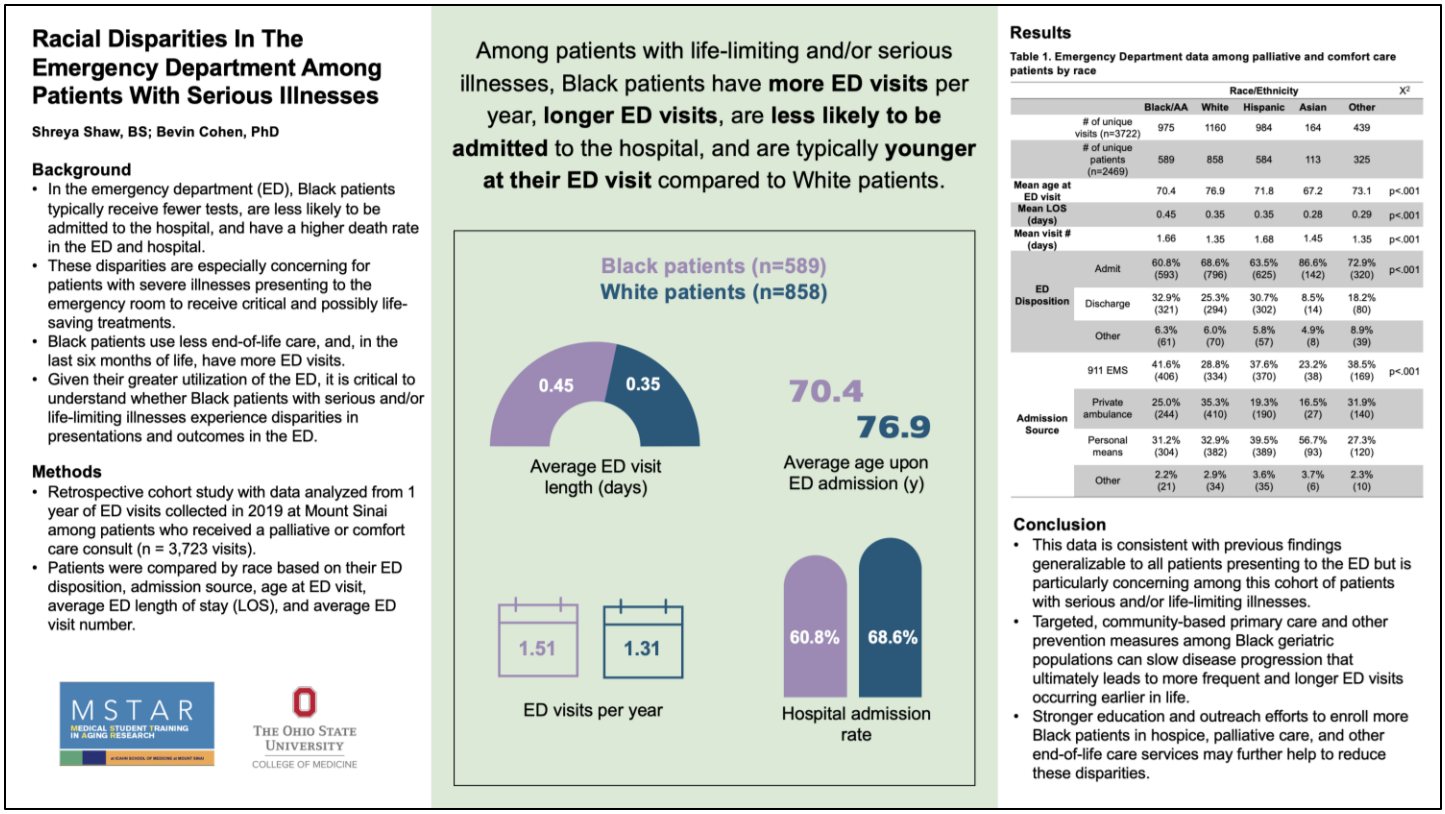

Racial Disparities In The Emergency Department Among Patients With Serious Illnesses

Shreya Shaw, BS; Bevin Cohen, PhD

Background

- In the emergency department (ED), Black patients typically receive fewer tests, are less likely to be admitted to the hospital, and have a higher death rate in the ED and hospital.
- These disparities are especially concerning for patients with severe illnesses presenting to the emergency room to receive critical and possibly life-saving treatments.
- Black patients use less end-of-life care, and, in the last six months of life, have more ED visits.
- Given their greater utilization of the ED, it is critical to understand whether Black patients with serious and/or life-limiting illnesses experience disparities in presentations and outcomes in the ED.

Methods

- Retrospective cohort study with data analyzed from 1 year of ED visits collected in 2019 at Mount Sinai among patients who received a palliative or comfort care consult (n = 3,723 visits).
- Patients were compared by race based on their ED disposition, admission source, age at ED visit, average ED length of stay (LOS), and average ED visit number.

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Among patients with life-limiting and/or serious illnesses, Black patients have **more ED visits** per year, **longer ED visits**, are **less likely to be admitted** to the hospital, and are typically **younger at their ED visit** compared to White patients.

Black patients (n=589)
White patients (n=858)

Results

Table 1. Emergency Department data among palliative and comfort care patients by race

		Race/Ethnicity					X^2
		Black/AA	White	Hispanic	Asian	Other	
	# of unique visits (n=3722)	975	1160	984	164	439	
	# of unique patients (n=2469)	589	858	584	113	325	
Mean age at ED visit		70.4	76.9	71.8	67.2	73.1	p<.001
Mean LOS (days)		0.45	0.35	0.35	0.28	0.29	p<.001
Mean visit # (days)		1.66	1.35	1.68	1.45	1.35	p<.001
ED Disposition	Admit	60.8% (593)	68.6% (796)	63.5% (625)	86.6% (142)	72.9% (320)	p<.001
	Discharge	32.9% (321)	25.3% (294)	30.7% (302)	8.5% (14)	18.2% (80)	
	Other	6.3% (61)	6.0% (70)	5.8% (57)	4.9% (8)	8.9% (39)	
Admission Source	911 EMS	41.6% (406)	28.8% (334)	37.6% (370)	23.2% (38)	38.5% (169)	p<.001
	Private ambulance	25.0% (244)	35.3% (410)	19.3% (190)	16.5% (27)	31.9% (140)	
	Personal means	31.2% (304)	32.9% (382)	39.5% (389)	56.7% (93)	27.3% (120)	
	Other	2.2% (21)	2.9% (34)	3.6% (35)	3.7% (6)	2.3% (10)	

Conclusion

- This data is consistent with previous findings generalizable to all patients presenting to the ED but is particularly concerning among this cohort of patients with serious and/or life-limiting illnesses.
- Targeted, community-based primary care and other prevention measures among Black geriatric populations can slow disease progression that ultimately leads to more frequent and longer ED visits occurring earlier in life.
- Stronger education and outreach efforts to enroll more Black patients in hospice, palliative care, and other end-of-life care services may further help to reduce these disparities.

"Among patients with life-limiting and/or serious illnesses, Black patients have more ED visits per year, longer ED visits, are less likely to be admitted to the hospital, and are typically younger at their ED visit compared to White patients."

RACIAL DISPARITIES IN THE EMERGENCY DEPARTMENT AMONG PATIENTS WITH SERIOUS ILLNESSES

Shreya Shaw, BS; Bevin Cohen, PhD

Background: The prevalence of racial disparities in healthcare has been well documented across a variety of medical settings, including in the emergency department (ED). Black patients typically receive lower Emergency Severity Index (ESI) scores, receive less tests in the ED, are less likely to be admitted to the hospital, and have a higher death rate in the ED and hospital. These disparities are especially concerning for patients with severe illnesses presenting to the emergency room to receive critical and possibly life-saving treatments. Previous research has shown that Black patients use less end-of-life care, and, in the last six months of life, have more ED visits. Given their greater utilization of the ED, it is critical to understand whether Black patients specifically with serious and/or life-limiting illness experience disparities in presentations and outcomes in the ED.

Methods: We conducted a retrospective cohort study using data from ED visits in 2019 at The Mount Sinai Hospital and Mount Sinai West among patients who received a palliative or comfort care consult (N = 3,723 patients). We estimated the association using a chi-squared test between race and the following outcomes: length of stay (LOS), ED disposition, discharge disposition, admission source, admission rate, and age at admission.

Results: Black patients had longer LOS than White patients (0.45 days vs 0.35 days, $p<.001$), higher ED visit rates per year (1.51 visits vs 1.31, $p<.001$), and were less likely to be admitted to the hospital from the ED (60.8% vs 68.6%, $p<.001$). Moreover, Black patients were more likely to be admitted via 911 EMS call (41.6% of Black patients vs 28.8% of White patients, $p<.001$), while White patients were more likely to be admitted via private ambulance (35.3% of White patients vs 25.0% of Black patients, $p<.001$). No significant differences were found in discharge dispositions among Black compared to White patients.

Conclusion: This data is consistent with previous findings generalizable to all patients presenting to the ED but is particularly concerning among this cohort of patients with serious and/or life-limiting illnesses. Targeted, community-based primary care and other prevention measures among Black geriatric populations can slow disease progression that ultimately leads to more frequent and longer ED visits occurring earlier in life. Moreover, stronger education and outreach efforts to enroll more Black patients in hospice, palliative care, and other end-of-life care services may further help to reduce these disparities.

Impact of Extreme Heat Exposure in Pregnancy on Maternal Health Outcomes

Daniela Shill, Melissa Blum, Donato Delngeniis, Yoko Nomura, Perry Sheffield
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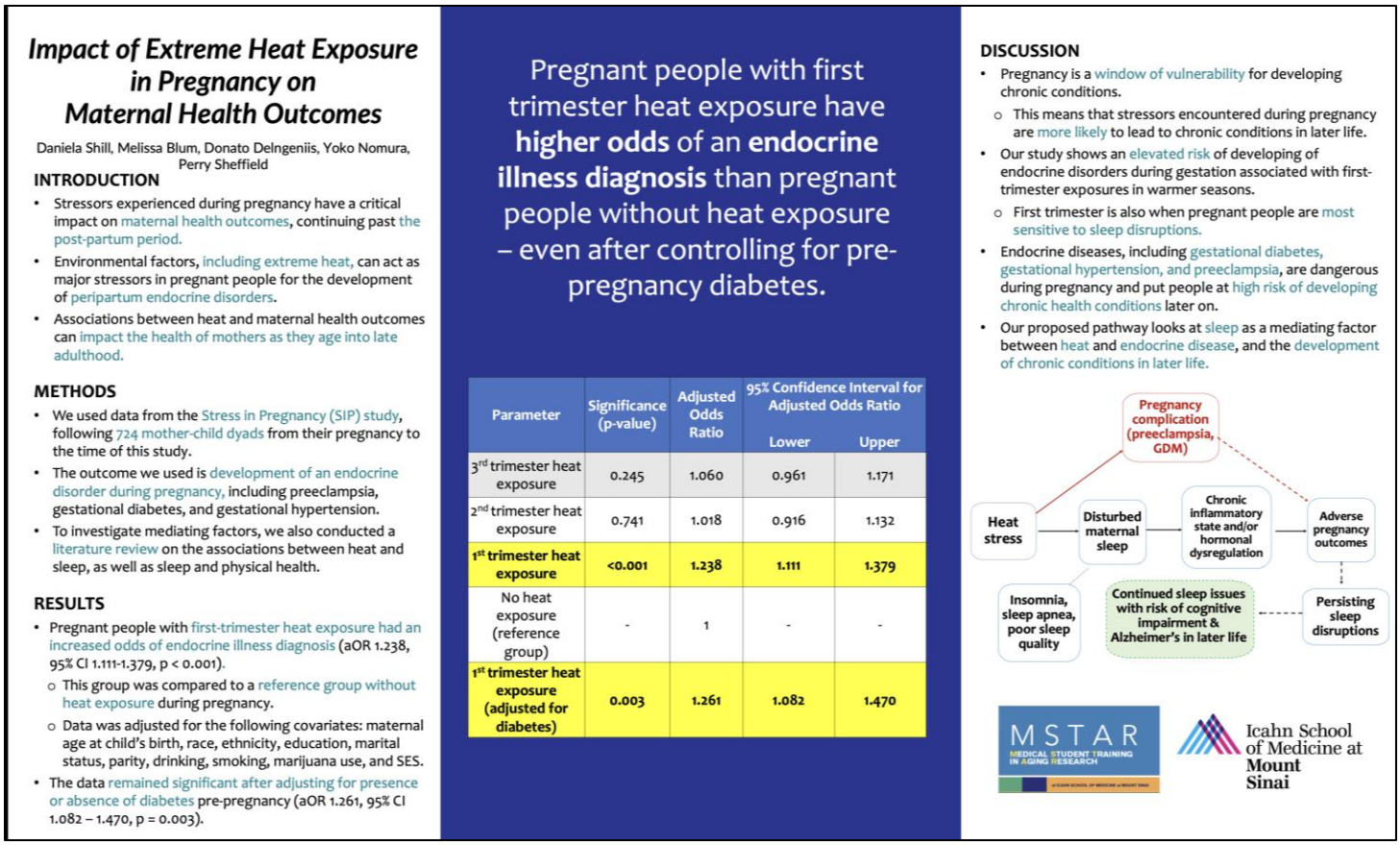

Impact of Extreme Heat Exposure in Pregnancy on Maternal Health Outcomes

Daniela Shill, Melissa Blum, Donato Delngeniis, Yoko Nomura, Perry Sheffield

INTRODUCTION

- Stressors experienced during pregnancy have a critical impact on maternal health outcomes, continuing past the post-partum period.
- Environmental factors, including extreme heat, can act as major stressors in pregnant people for the development of peripartum endocrine disorders.
- Associations between heat and maternal health outcomes can impact the health of mothers as they age into late adulthood.

METHODS

- We used data from the Stress in Pregnancy (SIP) study, following 724 mother-child dyads from their pregnancy to the time of this study.
- The outcome we used is development of an endocrine disorder during pregnancy, including preeclampsia, gestational diabetes, and gestational hypertension.
- To investigate mediating factors, we also conducted a literature review on the associations between heat and sleep, as well as sleep and physical health.

RESULTS

- Pregnant people with first-trimester heat exposure had an increased odds of endocrine illness diagnosis (aOR 1.238, 95% CI 1.111-1.379, p < 0.001).
  - This group was compared to a reference group without heat exposure during pregnancy.
  - Data was adjusted for the following covariates: maternal age at child's birth, race, ethnicity, education, marital status, parity, drinking, smoking, marijuana use, and SES.
- The data remained significant after adjusting for presence or absence of diabetes pre-pregnancy (aOR 1.261, 95% CI 1.082 – 1.470, p = 0.003).

Pregnant people with first trimester heat exposure have **higher odds** of an **endocrine illness diagnosis** than pregnant people without heat exposure – even after controlling for pre-pregnancy diabetes.

Parameter	Significance (p-value)	Adjusted Odds Ratio	95% Confidence Interval for Adjusted Odds Ratio	
			Lower	Upper
3rd trimester heat exposure	0.245	1.060	0.961	1.171
2nd trimester heat exposure	0.741	1.018	0.916	1.132
1st trimester heat exposure	**<0.001**	**1.238**	**1.111**	**1.379**
No heat exposure (reference group)	-	1	-	-
1st trimester heat exposure (adjusted for diabetes)	**0.003**	**1.261**	**1.082**	**1.470**

DISCUSSION

- Pregnancy is a window of vulnerability for developing chronic conditions.
  - This means that stressors encountered during pregnancy are more likely to lead to chronic conditions in later life.
- Our study shows an elevated risk of developing of endocrine disorders during gestation associated with first-trimester exposures in warmer seasons.
  - First trimester is also when pregnant people are most sensitive to sleep disruptions.
- Endocrine diseases, including gestational diabetes, gestational hypertension, and preeclampsia, are dangerous during pregnancy and put people at high risk of developing chronic health conditions later on.
- Our proposed pathway looks at sleep as a mediating factor between heat and endocrine disease, and the development of chronic conditions in later life.

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"Pregnant people with first trimester heat exposure have higher odds of developing chronic endocrine conditions than pregnant people without heat exposure – even after controlling for pre-pregnancy diabetes."

IMPACT OF EXTREME HEAT EXPOSURE IN PREGNANCY ON MATERNAL HEALTH OUTCOMES

Daniela Shill, Melissa Blum, Donato Delngeniis, Yoko Nomura, Perry Sheffield

Background: Stressors experienced during pregnancy have been shown to impact mothers' future health outcomes, with pregnancy acting as a critical window of vulnerability. The impacts of this window are likely to persist beyond the postpartum period, putting more people at risk for developing chronic health conditions as they age. As climate change continues to be a public health crisis, the effects of associated prenatal heat stressors on future health outcomes should be considered. Heat has been shown to be disruptive to sleep, particularly during pregnancy. Several studies have shown a connection between sleep disturbances and the development of chronic inflammation and hormonal dysregulation, both of which are known to increase susceptibility to endocrine illnesses later in life. This study examines the health outcomes among women from a New York City pregnancy cohort, hypothesizing that pregnancy during warmer seasons will increase the risk of developing peripartum endocrine disorders.

Methods: This study uses de-identified patient data from the Stress in Pregnancy (SIP) study, which followed 724 mother-child dyads from their pregnancy to the time of this study. Pregnant women in their second trimester receiving prenatal care at two NYC Hospitals from 2009-2014 were invited to enroll in the study. The dataset includes maternal questionnaires, physical assessments, and parental reports, and the data was analyzed using SPSS. The outcome we used is development of an endocrine disorder during pregnancy, including preeclampsia, gestational diabetes, and gestational hypertension.

Results: Pregnant people with first trimester heat exposure had an increased odds of endocrine illness diagnosis (aOR 1.238, 95% CI 1.111 – 1.379, $p < 0.001$) when compared to a reference group without heat exposure during their pregnancy. The increased odds of endocrine illness development remain after controlling for pre-pregnancy diabetes (aOR 1.261, 95% CI 1.082 – 1.470, $p = 0.003$).

Conclusion: We found an elevated risk of developing endocrine disorders during gestation associated with pregnancy during the warmer season. A potential mechanism of this association could be via sleep disturbance, which should be explored in future studies. Endocrine illnesses that develop during pregnancy can persist beyond the postpartum period and increase the risk of chronic health conditions in later life. Future research should focus on investigating associations between other stressors related to climate change and maternal health outcomes, in addition to developing effective mitigation strategies for vulnerable populations.

Comparing Frailty Indices in Surgical Outcomes of Transsphenoidal Pituitary Adenomas

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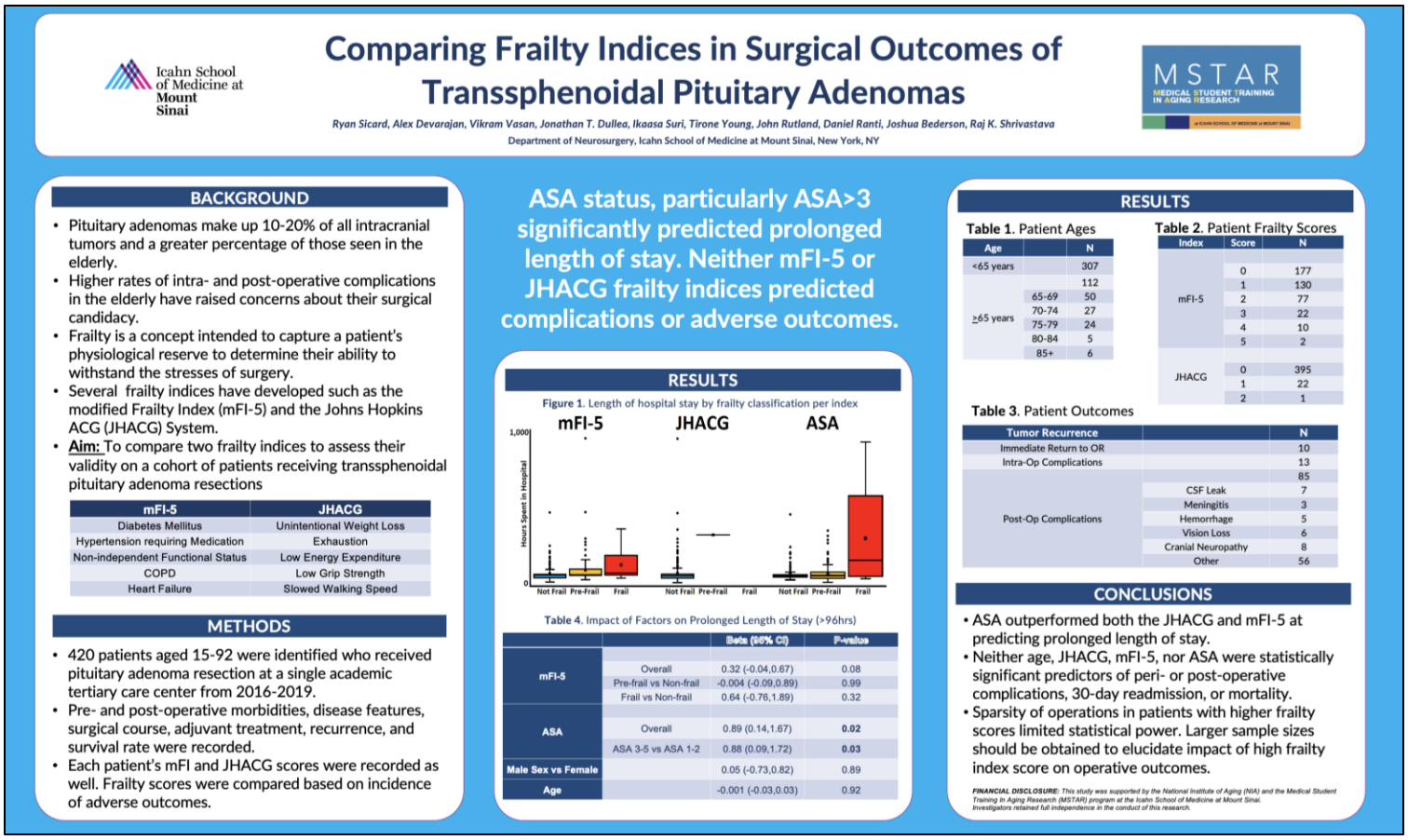

"ASA status, particularly ASA>3 significantly predicted prolonged length of stay. Neither mFI-5 or JHACG frailty indices predicted complications or adverse outcomes."

COMPARING FRAILTY INDICES IN SURGICAL OUTCOMES OF TRANSSPHENOIDAL PITUITARY ADENOMAS

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Introduction: Pituitary adenoma resection accounts for a substantial portion of the typical neurosurgical volume, particularly in the elderly population, and identifying suitable surgical candidates is a key component of decision-making. Up until recently, transsphenoidal surgery in the elderly has been a controversial topic, due to reported increased complication rates. Recently, methods of patient-specific metrics to determine surgical candidacy, regardless of age, have been developed. Frailty as a concept has gained traction for its multidimensional approach to describing patient outcomes and multiple indices have been developed. Thus, we aim to compare two frailty indices within a cohort of patients who received pituitary adenoma resections to characterize their validity.

Methods: A single-institution retrospective review was performed on 420 patients, aged between 15 to 92, who received surgery for skull-based pituitary adenoma between 2016 and 2019. Pre- and post-operative morbidities, disease features, surgical course, adjuvant treatment, recurrence, and survival rate were recorded. Components of the modified frailty index (mFI) and Johns Hopkins Frailty Assessment (JHACG) were used to calculate each patient's mFI-5 and JHACG scores. Frailty scores were compared based on the incidence of adverse outcomes.

Results: The median subject age was 55 with an interquartile range of 24. There were 112 subjects 65 or older. 395 subjects had a JHACG score of 0 while 23 had scores of 1+. For mFI, 177 subjects had a score of 0, 130 had a score of 1, and 111 had scores of 2+. The American Society of Anesthesiologists (ASA) score was significantly superior to both indices independently and patient age at predicting length of stay ($p=0.02$). Postoperative complications were noted in 85 patients, but no significant difference between the mFI-5 and JHACG was identified in predicting them ($p=0.23$). Patients experienced intraoperative complications in 13 instances and, again, there was no significant difference between the mFI-5 and JHACG's predictive ability ($p=0.87$). The mFI-5 trended toward significance in predicting outcomes better than the JHACG ($p=0.09$).

Conclusion: The mFI-5 and JHACG were found to be equal predictors of outcomes, post- and intra-operative complication rates, and length of stay in patients receiving pituitary adenoma resection. ASA status was superior to both indices for predicting length of stay. Limited number of high frailty patients, particularly for the JHACG, limited the ability to determine statistical significance. Further studies should be conducted on larger samples, but the mFI-5 and JHACG may be of limited prognostic value for patient selection for pituitary adenoma resection

Quantifying Changes In Vascular Oxidative Stress in the Microenvironment Of Vulnerable Neurons Over The Course Of Alzheimer's Disease Progression

Jacqueline Slobin, Alec K. McKendell, Jennifer I. Luebke, Elizabeth McDonough, Lisa Lowery, Dan E. Meyer, Patrick R. Hof, Merina Varghese

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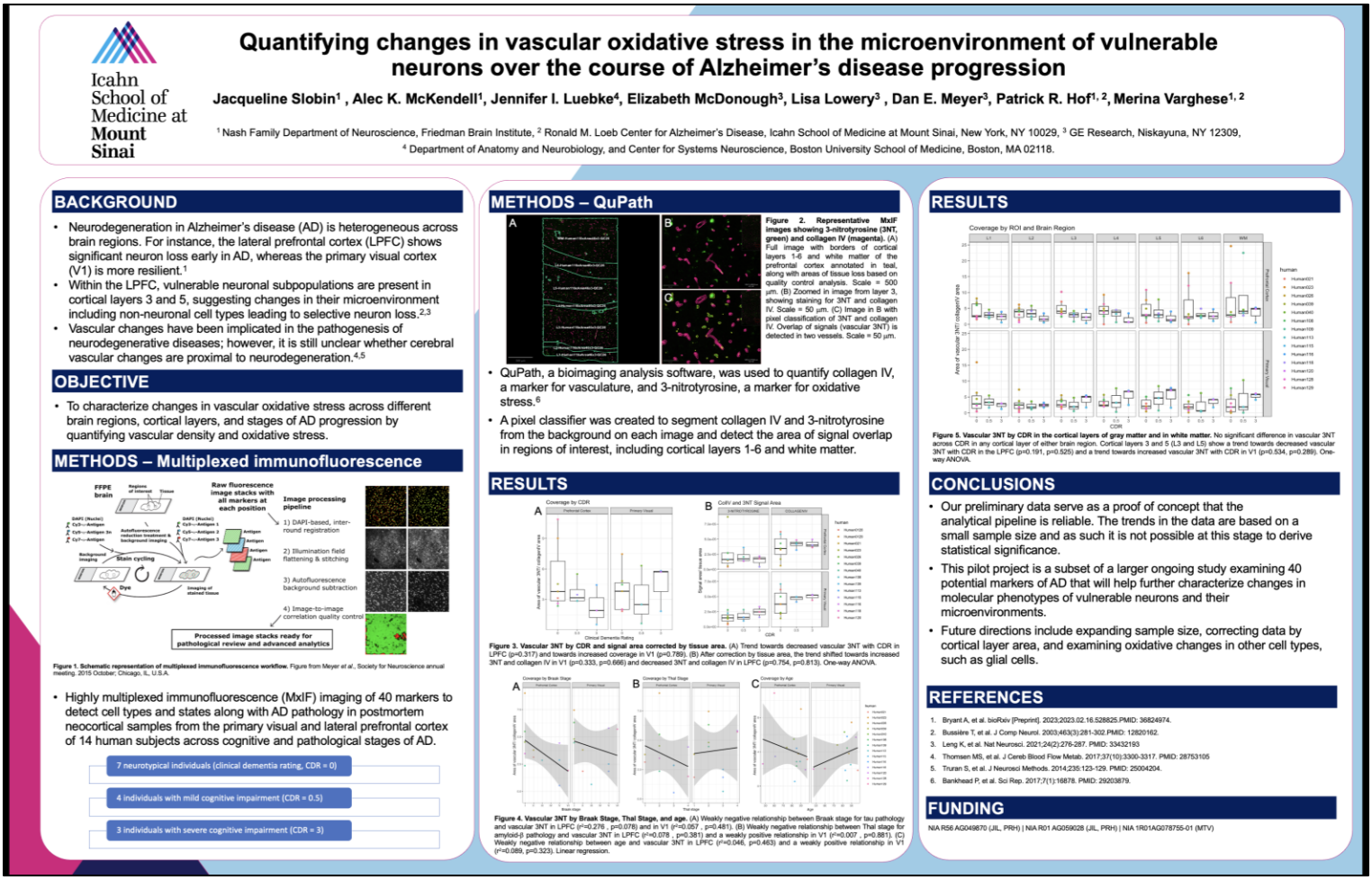

Quantifying changes in vascular oxidative stress in the microenvironment of vulnerable neurons over the course of Alzheimer's disease progression

Jacqueline Slobin[1] , Alec K. McKendell[1], Jennifer I. Luebke[4], Elizabeth McDonough[3], Lisa Lowery[3] , Dan E. Meyer[3], Patrick R. Hof[1, 2], Merina Varghese[1, 2]

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BACKGROUND

- Neurodegeneration in Alzheimer's disease (AD) is heterogeneous across brain regions. For instance, the lateral prefrontal cortex (LPFC) shows significant neuron loss early in AD, whereas the primary visual cortex (V1) is more resilient.[1]
- Within the LPFC, vulnerable neuronal subpopulations are present in cortical layers 3 and 5, suggesting changes in their microenvironment including non-neuronal cell types leading to selective neuron loss.[2,3]
- Vascular changes have been implicated in the pathogenesis of neurodegenerative diseases; however, it is still unclear whether cerebral vascular changes are proximal to neurodegeneration.[4,5]

OBJECTIVE

- To characterize changes in vascular oxidative stress across different brain regions, cortical layers, and stages of AD progression by quantifying vascular density and oxidative stress.

METHODS – Multiplexed immunofluorescence

Figure 1. Schematic representation of multiplexed immunofluorescence workflow. Figure from Meyer et al., Society for Neuroscience annual meeting, 2015 October; Chicago, IL, U.S.A.

- Highly multiplexed immunofluorescence (MxIF) imaging of 40 markers to detect cell types and states along with AD pathology in postmortem neocortical samples from the primary visual and lateral prefrontal cortex of 14 human subjects across cognitive and pathological stages of AD.

7 neurotypical individuals (clinical dementia rating, CDR = 0)

4 individuals with mild cognitive impairment (CDR = 0.5)

3 individuals with severe cognitive impairment (CDR = 3)

METHODS – QuPath

Figure 2. Representative MxIF images showing 3-nitrotyrosine (3NT, green) and collagen IV (magenta). (A) Full image with borders of cortical layers 1-6 and white matter of the prefrontal cortex annotated in teal, along with areas of tissue loss based on quality control analysis. Scale = 500 μm. (B) Zoomed in image from layer 3, showing staining for 3NT and collagen IV. Scale = 50 μm. (C) Image in B with pixel classification of 3NT and collagen IV. Overlap of signals (vascular 3NT) is detected in two vessels. Scale = 50 μm.

- QuPath, a bioimaging analysis software, was used to quantify collagen IV, a marker for vasculature, and 3-nitrotyrosine, a marker for oxidative stress.[6]
- A pixel classifier was created to segment collagen IV and 3-nitrotyrosine from the background on each image and detect the area of signal overlap in regions of interest, including cortical layers 1-6 and white matter.

RESULTS

Figure 3. Vascular 3NT by CDR and signal area corrected by tissue area. (A) Trend towards decreased vascular 3NT with CDR in LPFC (p=0.317) and towards increased coverage in V1 (p=0.789). (B) After correction by tissue area, the trend shifted towards increased 3NT and collagen IV in V1 (p=0.333, p=0.666) and decreased 3NT and collagen IV in LPFC (p=0.754, p=0.813). One-way ANOVA.

Figure 4. Vascular 3NT by Braak Stage, Thal Stage, and age. (A) Weakly negative relationship between Braak stage for tau pathology and vascular 3NT in LPFC (r^2=0.278 , p=0.078) and in V1 (r^2=0.057 , p=0.481). (B) Weakly negative relationship between Thal stage for amyloid-β pathology and vascular 3NT in LPFC (r^2=0.078 , p=0.381) and a weakly positive relationship in V1 (r^2=0.007 , p=0.881). (C) Weakly negative relationship between age and vascular 3NT in LPFC (r^2=0.046, p=0.463) and a weakly positive relationship in V1 (r^2=0.089, p=0.323). Linear regression.

RESULTS

Figure 5. Vascular 3NT by CDR in the cortical layers of gray matter and in white matter. No significant difference in vascular 3NT across CDR in any cortical layer of either brain region. Cortical layers 3 and 5 (L3 and L5) show a trend towards decreased vascular 3NT with CDR in the LPFC (p=0.191, p=0.525) and a trend towards increased vascular 3NT with CDR in V1 (p=0.534, p=0.289). One-way ANOVA.

CONCLUSIONS

- Our preliminary data serve as a proof of concept that the analytical pipeline is reliable. The trends in the data are based on a small sample size and as such it is not possible at this stage to derive statistical significance.
- This pilot project is a subset of a larger ongoing study examining 40 potential markers of AD that will help further characterize changes in molecular phenotypes of vulnerable neurons and their microenvironments.
- Future directions include expanding sample size, correcting data by cortical layer area, and examining oxidative changes in other cell types, such as glial cells.

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"Characterizing the features of vascular changes in various brain regions over the course of disease progression can yield further insight to inform treatments for AD."

QUANTIFYING CHANGES IN VASCULAR OXIDATIVE STRESS IN THE MICROENVIRONMENT OF VULNERABLE NEURONS OVER THE COURSE OF ALZHEIMER'S DISEASE PROGRESSION

Jacqueline Slobin, Alec K. McKendell, Jennifer I. Luebke, Elizabeth McDonough, Lisa Lowery, Dan E. Meyer, Patrick R. Hof, Merina Varghese

Introduction: Alzheimer's disease (AD) can be characterized by cellular changes and degeneration of vulnerable subpopulations of neurons that lead to cognitive decline. Degeneration in AD is heterogeneous across brain regions. For instance, the lateral prefrontal cortex (LPFC) shows significant cellular changes, while the primary visual cortex (V1) tends to be affected later and exhibits less neurodegeneration. Additionally, previous work has shown that neurons with a high content of somatodendritic non-phosphorylated neurofilament protein and located in layers 3 and 5 are more vulnerable to degeneration in AD. However, further characterization of non-neuronal cell types, such as vasculature, in the microenvironment of vulnerable neurons is necessary. Studies suggest that cerebral vascular dysfunction through oxidative stress occurs from an accumulation of soluble amyloid β protein. However, it is still unclear whether cerebral vascular changes are proximal to neurodegenerative changes. Therefore, characterizing the features of vascular changes in various brain regions over the course of disease progression can yield further insight to inform treatments for AD.

Objective: The aim of this study was to characterize changes in vascular oxidative stress across different brain regions, cortical layers, and stages of AD progression by quantifying vascular density and oxidative stress.

Methods: Multiplex immunofluorescence (MxIF) analysis was used to characterize 40 potential markers of AD in postmortem neocortical samples of 14 individuals. The samples were obtained from both the lateral prefrontal cortex and primary visual cortex of 7 neurotypical subjects (CDR=0), 4 cases with mild cognitive impairment (CDR=0.5), and 3 cases with severe cognitive impairment (CDR=3). QuPath, a bioimaging analysis software, was used to quantify collagen IV, a market for vasculature, and 3-nitrotyrosine, a marker for oxidative stress. A pixel classifier was created to segment collagen IV and 3-nitrotyrosine from the background on each image and detect the area of signal overlap of 3-nitrotyrosine and collagen IV in several regions of interest, including cortical layers 1-6 and white matter.

Results: Data were analyzed using one-way ANOVA and linear regression in R. There was a trend towards decreased vascular 3NT with CDR in LPFC ($p=0.317$) and towards increased coverage in V1 ($p=0.789$). After correction by tissue area, the trend shifted towards increased 3NT and collagen IV in V1 ($p=0.333$, $p=0.666$) and decreased 3NT and collagen IV in LPFC ($p=0.754$, $p=0.813$). Linear regression analyses show a weakly negative relationship between Braak stage for tau pathology and vascular 3NT in LPFC ($r^2=0.276$, $p=0.078$) and in V1 ($r^2=0.057$, $p=0.481$). There was a weakly negative relationship between Thal stage for amyloid-b pathology and vascular 3NT in LPFC ($r^2=0.078$, $p=0.381$) and a weakly positive relationship in V1 ($r2=0.007$, $p=0.881$). Additionally, there was a weakly negative relationship between age and vascular 3NT in LPFC ($r^2=0.046$, $p=0.463$) and a weakly positive relationship in V1 ($r^2=0.089$, $p=0.323$). There was no significant difference in vascular 3NT across CDR in any cortical layer of either brain region. Cortical layers 3 and 5 (L3 and L5) show a trend towards decreased vascular 3NT with CDR in the LPFC ($p=0.191$, $p=0.525$) and a trend towards increased vascular 3NT with CDR in V1 ($p=0.534$, $p=0.289$).

Conclusions: Our preliminary data serve as a proof of concept that the analytical pipeline is reliable. The trends in the data are based on a small sample size and as such, it is not possible at this stage to derive statistical significance. This pilot project is a subset of a larger ongoing study examining 40 potential markers of AD that will help further characterize changes in molecular phenotypes of vulnerable neurons and their microenvironments. Future directions include expanding sample size, correcting data by cortical layer area, and examining oxidative changes in other cell types, such as glial cells.

The Mitochondrial Unfolded Protein Response Predicts the Immune Landscape During Melanomagenesis

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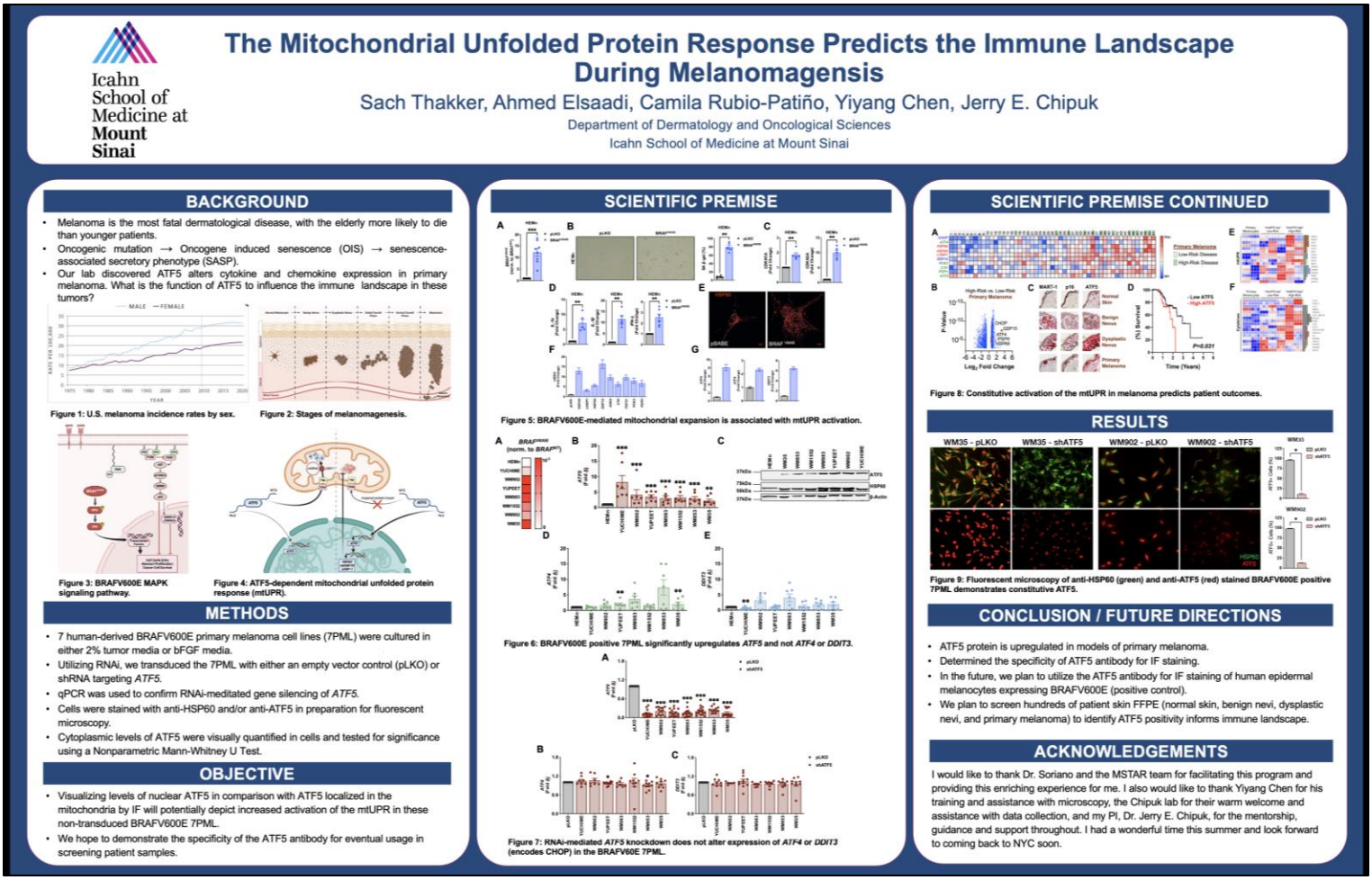

"Overall, ATF5 protein was upregulated in models of primary melanoma. Additionally, we determined the specificity of ATF5 antibody for IF staining."

THE MITOCHONDRIAL UNFOLDED PROTEIN RESPONSE PREDICTS THE IMMUNE LANDSCAPE DURING MELANOMAGENESIS.

Sach Thakker, Ahmed Elsaadi, Camila Rubio-Patiño, Yiyang Chen, Jerry E. Chipuk.

Background: Melanoma incidence is growing yearly worldwide. This is concerning given that melanoma is the most fatal dermatological disease. Additionally, the elderly are at greater risks of mortality compared to their younger counterparts. In the skin, melanocytes reside in the basal layer of the epidermis, where they transfer pigment to keratinocytes to offer important protection against the ultraviolet radiation of the sun. With age, melanocytes can develop oncogenic mutations (*e.g.*, $BRAF^{V600E}$) that results in unregulated growth and formation of clustered cells called a nevus (*i.e.,* a mole). Within these mutated melanocytes, cellular senescence is an anti-cancer program engaged to halt proliferation and prevent malignant transformation into melanoma. This program results in significant changes to the structure and function of the mutated melanocytes via the acquisition of a senescence-associated secretory phenotype (SASP). The SASP phenotype is defined as a collection of secretory cytokines, chemokines, and metalloproteinases that help the senescent cell modulate its microenvironment. This process is collectively referred to as oncogene induced senescence (OIS), and activation of additional DNA mutations may stimulate transformation of a mole into melanoma.

In cellular models of senescence, the $BRAF^{V600E}$ mutation induces a stress signaling pathway referred to as the mitochondrial unfolded protein response (mtUPR). The mtUPR serves to mitigate stress signaling by returning cellular metabolism and organelle quality to homeostasis.
This mitochondrial program is induced by cooperation between three transcription factors: Activating Transcription Factor 4 (ATF4), its homolog ATF5, and the C/EBP homologous protein CHOP. Little is known about the role of the mtUPR (especially ATF5) in cancer biology, melanoma, or the immune landscape.

Objective: Visualizing levels of nuclear ATF5 in comparison with ATF5 localized in the mitochondria by IF will potentially depict increased activation of the mtUPR in these non-transduced BRAFV600E 7PML. We hope to demonstrate the specificity of the ATF5 antibody for eventual usage in screening patient samples.

Methods: Human derived BRAFV600E primary melanoma cell lines (7PML) were cultured in either 2% tumor media or bFGF media. Utilizing RNAi, we transduced the 7PML with either an empty vector control (pLKO) or shRNA targeting *ATF5.* qPCR was used to confirm RNAi-meditated gene silencing of *ATF5.* Cells were stained with anti-HSP60 and/or anti-ATF5 in preparation for fluorescent microscopy. Cytoplasmic levels of ATF5 were visually quantified in cells and tested for significance using a Nonparametric Mann-Whitney U Test.

Results: Fluorescent microscopy images were taken of the 7PML under pLKO and shATF5 conditions. The 7PML were constitutively positive for ATF5 and knockdown decreased levels significantly. For example, the WM35 pLKO had a 93.87% average positive cytoplasmic ATF5 signature while the WM35 shATF5 had a 9.45% average cytoplasmic ATF5 signature.

Conclusions/Future Directions: Overall, ATF5 protein was upregulated in models of primary melanoma. Additionally, we determined the specificity of ATF5 antibody for IF staining. In the future, we plan to utilize the ATF5 antibody for IF staining of human epidermal melanocytes expressing BRAFV600E (positive control). We plan to screen hundreds of patient skin FFPE (normal skin, benign nevi, dysplastic nevi, and primary melanoma) to identify ATF5 positivity informs immune landscape. This project has the potential to improve prognosis for melanoma by extrapolating tumor microenvironment including immune infiltrate information during melanomagenesis.

Predictors of Length of Stay and 30-day Mortality in the Medical Management of Elderly Patients with Intracerebral Hemorrhage

Devarshi Vasa, Christina P. Rossitto, Christopher P. Kellner
Department of Neurosurgery, Icahn School of Medicine at Mount Sinai

Predictors of Length of Stay and 30-day Mortality in the Medical Management of Elderly Patients with Intracerebral Hemorrhage

Devarshi Vasa[1], Christina P. Rossitto[1], Christopher P. Kellner[1]
1Department of Neurosurgery, Icahn School of Medicine at Mount Sinai

INTRODUCTION

- Intracerebral hemorrhage (ICH) is the second most common form of stroke and is associated with high morbidity and mortality.
- While incidence of ICH increases with age, it is not known whether factors associated with outcomes differ by age for older adults.
- We aimed to investigate predictors of length of stay (LOS) and mortality after medical management of non-elderly (age <65), early elderly (age 65-80), and advanced elderly (age >80) ICH patients.

METHODS

- A single-center retrospective chart review was conducted to identify all patients with ICH who were medically managed between 2022 and 2023.
- Patients who underwent hematoma evacuation were excluded.
- Clinical measures including comorbidities, LOS, and mortality were collected. Hematoma volumes were calculated using the ABC/2 method on axial head CT scans closest to the time of bleed.
- Univariate models were built to determine factors associated with LOS, ICU LOS, and 30-day mortality.

RESULTS

- Compared to non-elderly patients, early elderly (OR = 3.85; 95% CI = 2.41 – 5.29) and advanced elderly patients (OR = 5.50; 95% CI = 4.05 – 6.95) were more likely to have a history of atrial fibrillation ($\chi2$ = 6.32; p = 0.042).
- ANOVA and post hoc Turkey HSD indicated that early-elderly patients had greater mean hematoma volumes compared to non-elderly (28.1 vs 12.1 mL; p =0.037).
- Early elderly patients had a longer LOS compared to advanced elderly patients (20.37 ± 6.83 vs. 10.27 ± 5.53 days, p = 0.048).
- ICU LOS (p = 0.162) and 30-day mortality ($\chi2$ = 2.17; p = 0.338) were similar between all groups
- Hematoma volumes were not associated with LOS or 30-day mortality for any age group.

DISCUSSION

- Compared to non-elderly patients, early elderly patients were 3.85 times more likely to have atrial fibrillation while advanced elderly patients were 5.5 times more likely.
- Early elderly patients had a greater LOS and hematoma volumes compared to advanced elderly patients and non-elderly patients respectively, while 30-day mortality was similar.
- Understanding factors associated with LOS and mortality may provide predictive value for a patient's hospital course and highlights the need of medical optimization for elderly ICH patients.

Early elderly patients (age 65-80) had greater LOS and hematoma volumes, despite similar 30-day mortality.

Understanding outcomes after ICH may provide predictive value for a patient's hospital course.

Table 1. Demographics and comorbidities of ICH patients, grouped by age

	Non-elderly (age <65) N=26	Early elderly (age 65-80) N=17	Advanced elderly (age >80) N=16	p-value
Age, mean (95% CI)	51.63 (47.28, 55.99)	72.86 (70.72, 75.00)	86.06 (83.63, 88.48)	<0.001
Gender (%)				0.012
Male	18 (69.2)	11 (64.7)	4 (25.0)	
Female	8 (30.8)	6 (35.3)	12 (75.0)	
Ethnicity (%)				0.010
Asian	2 (7.7)	5 (29.4)	2 (12.5)	
Black	8 (30.8)	3 (17.6)	2 (12.5)	
Hispanic	12 (46.2)	2 (11.8)	4 (25.0)	
White	2 (7.7)	7 (41.2)	3 (18.8)	
Other	1 (3.8)	0 (0)	4 (25.0)	
HTN (%)	20 (76.9)	15 (88.2)	15 (93.8)	0.302
HLD (%)	10 (38.5)	12 (70.6)	10 (62.5)	0.087
Diabetes (%)	6 (23.1)	9 (52.9)	8 (50.0)	0.083
CAD/MI (%)	2 (7.7)	4 (23.5)	5 (31.3)	0.135
PAD (%)	2 (7.7)	2 (11.8)	1 (6.3)	0.835
Heart Failure (%)	4 (15.4)	4 (23.5)	4 (25.0)	0.699
Afib (%)	4 (15.4)	7 (41.2)	8 (50.0)	0.042

Icahn School of Medicine at Mount Sinai

MSTAR MEDICAL STUDENT TRAINING IN AGING RESEARCH

FINANCIAL DISCLOSURES
This study was supported by the National Institute for Aging (NIA) and the Medical Student Training in Aging Research (MSTAR) Program at the Icahn School of Medicine at Mount Sinai. The investigators retained full independence in the conduct of this research.

Figure 1. Hematoma volumes after ICH, grouped by age

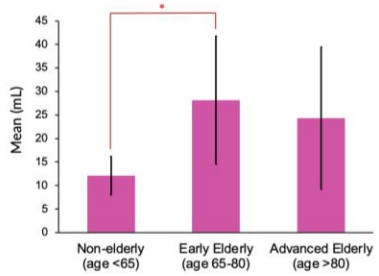

Figure 2. Hospital length of stay after ICH, grouped by age

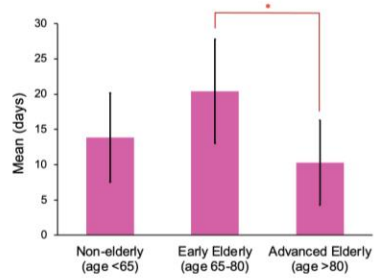

Table 2. LOS and mortality differences, grouped by age

	Non-elderly (age <65)	Early elderly (age 65-80)	Advanced elderly (age >80)	p-value
Hospital LOS [days (95% CI)]	13.86 (7.54, 20.18)	20.37 (12.99, 27.76)	10.27 (4.26, 16.29)	0.048
ICU LOS [days (95% CI)]	7.28 (3.64, 10.92)	10.80 (4.01, 17.59)	4.25 (1.10, 7.41)	0.165
30-day mortality [n (%)]	7 (26.9)	8 (47.1)	7 (43.8)	0.337

"Early elderly patients (age 65-80) had greater LOS and hematoma volumes, despite similar 30-day mortality. Understanding outcomes after ICH may provide predictive value for a patient's hospital course."

PREDICTORS OF LENGTH OF STAY AND 30-DAY MORTALITY IN THE MEDICAL MANAGEMENT OF ELDERLY PATIENTS WITH INTRACEREBRAL HEMORRHAGE.

Devarshi Vasa, Christina P. Rossitto, Christopher P. Kellner

Background: Intracerebral hemorrhage (ICH) is the second most common form of stroke and is associated with high morbidity and mortality. Incidence of ICH increases with age; however, it is not known whether factors associated with outcomes differ by age for older adults. Therefore, we aimed to investigate predictors of length of stay (LOS) and mortality after medical management of non-elderly (age <65), early elderly (age 65-80), and advanced elderly (age >80) ICH patients.

Methods: A single-center retrospective chart review was conducted to identify all patients with ICH who were medically managed between 2022 and 2023. Patients who underwent hematoma evacuation were excluded. Clinical measures including comorbidities, LOS, and mortality were collected. Hematoma volumes were calculated using the ABC/2 method on axial head CT scans closest to the time of bleed. Univariate models were built to determine factors associated with LOS, ICU LOS, and 30-day mortality.

Results: Of 59 patients with ICH (mean age 67.08 ± 4.33), 26 patients were non-elderly (44.1%; age 51.63 ± 4.35), 17 patients were early elderly (28.8%; age 72.86 ± 2.14), and 16 patients were advanced elderly (27.1%; age 86.06 ± 2.43). Compared to non-elderly patients, early elderly (OR = 3.85; 95% CI = 2.41 – 5.29) and advanced elderly patients (OR = 5.50; 95% CI = 4.05 – 6.95) were more likely to have a history of atrial fibrillation ($\chi 2 = 6.32$; $p = 0.042$). ANOVA and post hoc Turkey HSD indicated that early-elderly patients had greater mean hematoma volumes compared to non-elderly (28.1 vs 12.1 mL; $p = 0.037$). Furthermore, early elderly patients had a longer LOS compared to advanced elderly patients (20.37 ± 6.83 vs. 10.27 ± 5.53 days, $p = 0.048$). ICU LOS ($p = 0.162$) and 30-day mortality ($\chi 2 = 2.17$; $p = 0.338$) were similar between all groups. Hematoma volumes were not associated with LOS or 30-day mortality for any age group.

Conclusion: Early elderly patients had a greater LOS and greater hematoma volumes compared to advanced elderly patients and non-elderly patients respectively, while ICU LOS and 30-day mortality were similar. Understanding factors associated with LOS and mortality may provide predictive value for a patient's hospital course and highlights the importance of medical optimization for elderly ICH patients.

The Impact of Topical Oxygen Therapy on Wound Healing: Assessing Efficacy and the Influence of Patient Characteristics in a Single-Institution Retrospective Chart Review

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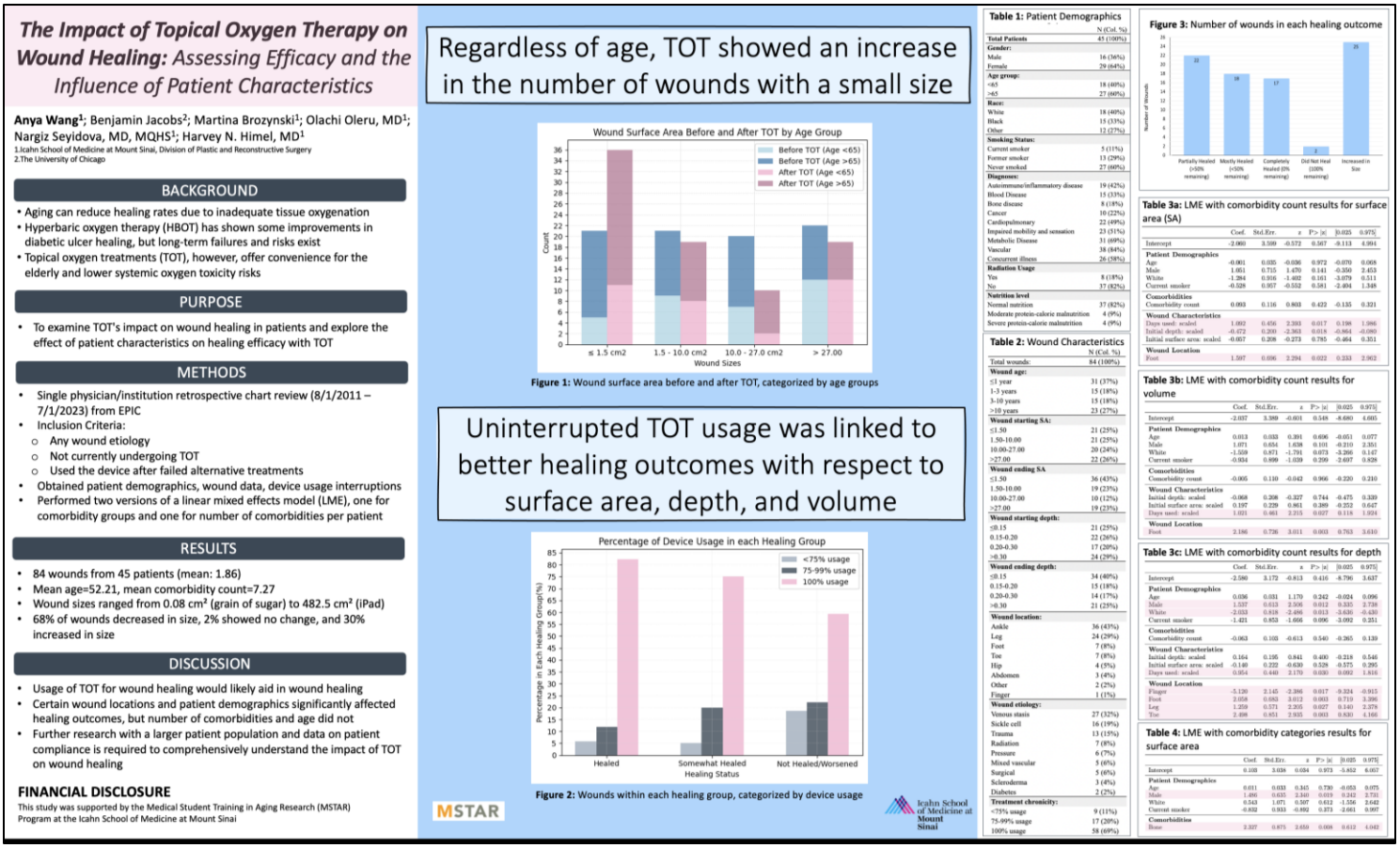

The Impact of Topical Oxygen Therapy on Wound Healing: *Assessing Efficacy and the Influence of Patient Characteristics*

Anya Wang[1]; Benjamin Jacobs[2]; Martina Brozynski[1]; Olachi Oleru, MD[1]; Nargiz Seyidova, MD, MQHS[1]; Harvey N. Himel, MD[1]
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2.The University of Chicago

BACKGROUND

- Aging can reduce healing rates due to inadequate tissue oxygenation
- Hyperbaric oxygen therapy (HBOT) has shown some improvements in diabetic ulcer healing, but long-term failures and risks exist
- Topical oxygen treatments (TOT), however, offer convenience for the elderly and lower systemic oxygen toxicity risks

PURPOSE

- To examine TOT's impact on wound healing in patients and explore the effect of patient characteristics on healing efficacy with TOT

METHODS

- Single physician/institution retrospective chart review (8/1/2011 – 7/1/2023) from EPIC
- Inclusion Criteria:
  - Any wound etiology
  - Not currently undergoing TOT
  - Used the device after failed alternative treatments
- Obtained patient demographics, wound data, device usage interruptions
- Performed two versions of a linear mixed effects model (LME), one for comorbidity groups and one for number of comorbidities per patient

RESULTS

- 84 wounds from 45 patients (mean: 1.86)
- Mean age=52.21, mean comorbidity count=7.27
- Wound sizes ranged from 0.08 cm² (grain of sugar) to 482.5 cm² (iPad)
- 68% of wounds decreased in size, 2% showed no change, and 30% increased in size

DISCUSSION

- Usage of TOT for wound healing would likely aid in wound healing
- Certain wound locations and patient demographics significantly affected healing outcomes, but number of comorbidities and age did not
- Further research with a larger patient population and data on patient compliance is required to comprehensively understand the impact of TOT on wound healing

FINANCIAL DISCLOSURE
This study was supported by the Medical Student Training in Aging Research (MSTAR) Program at the Icahn School of Medicine at Mount Sinai

Regardless of age, TOT showed an increase in the number of wounds with a small size

Wound Surface Area Before and After TOT by Age Group

Figure 1: Wound surface area before and after TOT, categorized by age groups

Uninterrupted TOT usage was linked to better healing outcomes with respect to surface area, depth, and volume

Percentage of Device Usage in each Healing Group

Figure 2: Wounds within each healing group, categorized by device usage

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Table 1: Patient Demographics

	N (Col. %)
Total Patients	45 (100%)
Gender:	
Male	16 (36%)
Female	29 (64%)
Age group:	
<65	18 (40%)
>65	27 (60%)
Race:	
White	18 (40%)
Black	15 (33%)
Other	12 (27%)
Smoking Status:	
Current smoker	5 (11%)
Former smoker	13 (29%)
Never smoked	27 (60%)
Diagnoses:	
Autoimmune/inflammatory disease	19 (42%)
Blood Disease	15 (33%)
Bone disease	8 (18%)
Cancer	10 (22%)
Cardiopulmonary	22 (49%)
Impaired mobility and sensation	23 (51%)
Metabolic Disease	31 (69%)
Vascular	38 (84%)
Concurrent illness	26 (58%)
Radiation Usage	
Yes	8 (18%)
No	37 (82%)
Nutrition level	
Normal nutrition	37 (82%)
Moderate protein-caloric malnutrition	4 (9%)
Severe protein-caloric malnutrition	4 (9%)

Table 2: Wound Characteristics

	N (Col. %)
Total wounds:	84 (100%)
Wound age:	
≤1 year	31 (37%)
1-3 years	15 (18%)
3-10 years	15 (18%)
>10 years	23 (27%)
Wound starting SA:	
≤1.50	21 (25%)
1.50-10.00	21 (25%)
10.00-27.00	20 (24%)
>27.00	22 (26%)
Wound ending SA	
≤1.50	36 (43%)
1.50-10.00	19 (23%)
10.00-27.00	10 (12%)
>27.00	19 (23%)
Wound starting depth:	
≤0.15	21 (25%)
0.15-0.20	22 (26%)
0.20-0.30	17 (20%)
>0.30	24 (29%)
Wound ending depth:	
≤0.15	34 (40%)
0.15-0.20	15 (18%)
0.20-0.30	14 (17%)
>0.30	21 (25%)
Wound location:	
Ankle	36 (43%)
Leg	24 (29%)
Foot	7 (8%)
Toe	7 (8%)
Hip	4 (5%)
Abdomen	3 (4%)
Other	2 (2%)
Finger	1 (1%)
Wound etiology:	
Venous stasis	27 (32%)
Sickle cell	16 (19%)
Trauma	13 (15%)
Radiation	7 (8%)
Pressure	6 (7%)
Mixed vascular	5 (6%)
Surgical	5 (6%)
Scleroderma	3 (4%)
Diabetes	2 (2%)
Treatment chronicity:	
<75% usage	9 (11%)
75-99% usage	17 (20%)
100% usage	58 (69%)

Figure 3: Number of wounds in each healing outcome

Table 3a: LME with comorbidity count results for surface area (SA)

	Coef.	Std.Err.	z	P> |z|	[0.025	0.975]
Intercept	-2.060	3.589	-0.572	0.567	-9.113	4.994
Patient Demographics						
Age	-0.001	0.035	-0.036	0.972	-0.070	0.068
Male	1.051	0.715	1.470	0.141	-0.350	2.453
White	-1.284	0.916	-1.402	0.161	-3.079	0.511
Current smoker	-0.528	0.957	-0.552	0.581	-2.404	1.348
Comorbidities						
Comorbidity count	0.093	0.116	0.803	0.422	-0.135	0.321
Wound Characteristics						
Days used: scaled	1.102	0.456	2.393	0.017	0.198	1.996
Initial depth: scaled	-0.472	0.200	-2.363	0.018	-0.864	-0.080
Initial surface area: scaled	-0.057	0.208	-0.273	0.785	-0.464	0.351
Wound Location						
Foot	1.597	0.696	2.294	0.022	0.233	2.962

Table 3b: LME with comorbidity count results for volume

	Coef.	Std.Err.	z	P> |z|	[0.025	0.975]
Intercept	-2.037	3.389	-0.601	0.548	-8.680	4.605
Patient Demographics						
Age	0.013	0.033	0.391	0.696	-0.051	0.077
Male	1.071	0.654	1.638	0.101	-0.210	2.351
White	-1.559	0.871	-1.791	0.073	-3.266	0.147
Current smoker	-0.934	0.899	-1.039	0.299	-2.697	0.828
Comorbidities						
Comorbidity count	-0.005	0.110	-0.042	0.966	-0.220	0.210
Wound Characteristics						
Initial depth: scaled	-0.068	0.208	-0.327	0.744	-0.475	0.339
Initial surface area: scaled	0.197	0.229	0.861	0.389	-0.252	0.647
Days used: scaled	1.021	0.461	2.215	0.027	0.118	1.924
Wound Location						
Foot	2.196	0.736	3.011	0.003	0.763	3.630

Table 3c: LME with comorbidity count results for depth

	Coef.	Std.Err.	z	P> |z|	[0.025	0.975]
Intercept	-2.580	3.172	-0.813	0.416	-8.796	3.637
Patient Demographics						
Age	0.036	0.031	1.170	0.242	-0.024	0.096
Male	1.537	0.613	2.506	0.012	0.335	2.738
White	-2.033	0.818	-2.486	0.013	-3.636	-0.430
Current smoker	-1.421	0.853	-1.666	0.096	-3.092	0.251
Comorbidities						
Comorbidity count	-0.063	0.103	-0.613	0.540	-0.265	0.139
Wound Characteristics						
Initial depth: scaled	0.164	0.195	0.841	0.400	-0.218	0.546
Initial surface area: scaled	-0.140	0.222	-0.630	0.528	-0.575	0.295
Days used: scaled	0.854	0.440	2.170	0.030	0.092	1.816
Wound Location						
Finger	-5.120	2.145	-2.386	0.017	-9.324	-0.915
Foot	2.058	0.683	3.012	0.003	0.719	3.396
Leg	1.259	0.571	2.205	0.027	0.140	2.378
Toe	2.498	0.851	2.935	0.003	0.830	4.166

Table 4: LME with comorbidity categories results for surface area

	Coef.	Std.Err.	z	P> |z|	[0.025	0.975]
Intercept	0.103	3.038	0.034	0.973	-5.852	6.057
Patient Demographics						
Age	0.011	0.033	0.345	0.730	-0.053	0.075
Male	1.486	0.635	2.340	0.019	0.242	2.731
White	0.543	1.071	0.507	0.612	-1.556	2.642
Current smoker	-0.832	0.933	-0.892	0.373	-2.661	0.997
Comorbidities						
Bone	2.327	0.875	2.659	0.008	0.612	4.042

"Regardless of age, topical oxygen therapy (TOT) showed an increase in the number of wounds with a small size. Uninterrupted TOT usage was linked to better healing outcomes with respect to surface area, depth, and volume."

THE IMPACT OF TOPICAL OXYGEN THERAPY ON WOUND HEALING: ASSESSING EFFICACY AND THE INFLUENCE OF PATIENT CHARACTERISTICS IN A SINGLE-INSTITUTION RETROSPECTIVE CHART REVIEW

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Background: Changes in skin biology from aging can reduce wound healing rates due to inadequate tissue oxygenation. Hyperbaric oxygen therapy (HBOT) has shown some improvements in ulcer healing, but long-term failures and risks exist. Topical oxygen treatments (TOT) offer a potentially safer alternative, especially for the elderly. This study thus examines TOT's impact on wound healing and the influence of patient characteristics on TOT efficacy at a single institution.

Methods: We conducted a retrospective chart review (8/1/2011 - 7/1/2023) of patients aged 23 to 97 (average: 52.21) who received TOT (GWR Medical inc.) from a single physician. The review included patients with any wound etiology, not currently undergoing TOT treatment, and who used the device after failed alternative treatments. Patients were instructed to use the device 90 minutes per day for four consecutive days, with three days of rest. The review collected patient demographics, wound data (including dimensions, age, location, etiology), and device usage interruptions from EPIC. Comorbidities were subdivided into body-system categories. Medical personnel assessed wound dimensions at patient visits using a centimeter ruler. Healing outcome was determined as the percent change in surface area, depth, and volume between the initial and final measurements. Data analysis employed two versions of a linear mixed effects (LME) model, one for comorbidity groups and one for the number of comorbidities per patient. We removed variables with a high collinearity and variance inflation factor (VIF) > 10.

Results: A total of 84 wounds with illness and trauma-related etiologies from 45 patients were included with an average of 1.86 wounds and 7.27 comorbidities per patient. Wound sizes ranged from 0.08 cm^2 (grain of sugar) to 482.5 cm^2 (Apple iPad), with a median of 10.25 cm^2. Overall, 68% of wounds decreased in size, 2% showed no change, and 30% increased in size. Complete healing was more common in patients with normal nutrition (94%), no history of radiation (88%), and non-smokers or former smokers (53% and 41%, respectively). No wound larger than 27 cm^2 achieved complete healing. The LME model with comorbidity count showed that the percent of days used significantly increased healing for surface area ($\beta = 1.092$, $p = 0.017$), depth ($\beta = 0.954$, $p = 0.030$), and volume ($\beta = 1.021$, $p = 0.027$). Certain wound locations (foot: $\beta = 1.597$, $p = 0.022$; leg: $\beta = 1.259$, $p = 0.027$; toe: $\beta = 2.498$, $p = 0.003$) and patient demographics (male: $\beta = 1.537$, $p = 0.012$) significantly enhanced wound healing. Initial wound depth ($\beta = -0.472$, $p = 0.018$) and white patients ($\beta = -2.033$, $p = 0.013$) had a negative impact on surface area healing. The overall comorbidity count showed no significant effect ($\beta = 0.093$, $p = 0.422$). The LME model with individual comorbidity categories showed the percent of days used ($\beta = 1.002$, $p = 0.032$) and bone disease ($\beta = 2.327$, $p = 0.008$) significantly increased surface area healing, while initial wound depth still significantly reduced surface area healing ($\beta = -0.519$, $p = 0.007$). Age had no significant impact on wound healing in either LME model.

Conclusion: Uninterrupted TOT usage was linked to increased healing with respect to surface area, depth, and volume, while greater initial depth hindered healing. Certain wound locations and patient demographics significantly affected outcomes, but the number of comorbidities and age did not. Further research with a larger patient population is required to comprehensively investigate the impact of TOT on wound healing and the influence of patient characteristics.

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