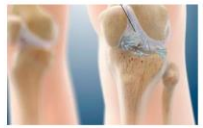
LOYOLA UNIVERSITY CHICAGO | HEALTH SCIENCES DIVISION

Hyperuricemia and Osteoarthritis, a potential Link

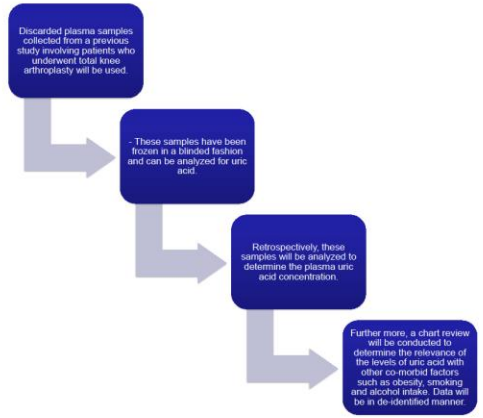
Khashayar Ahmadmehrabi, MD
Loyola University Medical Center

Introduction

- Osteoarthritis (OA) is the leading cause of musculoskeletal pathology worldwide and its prevalence is expected to rise[1]. OA typically affects the lower extremity joints, most commonly the hip and knee joints, and is the leading cause of lower extremity disability in older adults ([1]).
- Though the overlap between normal structural changes in aging and the pathological process of OA present a challenge to epidemiological studies, it is estimated that OA affects approximately 15% of the world population, with an estimated lifetime risk of developing OA being 40% in men and 47% in women (1,2).
- Given the expected rise in prevalence of OA, it is important to better understand the inflammatory process and vascular dysfunction that is associated with OA and further identify biomarkers that may be associated with severe osteoarthritis.
- Gout, a state of excess uric acid, may be associated with a greater risk of developing knee osteoarthritis(3,4).



Methods



Conclusion

- **Ongoing data collection**
- **The goal is to see a trend between advanced OA and uric acid**
- **If there is a positive correlation, this could potentially imply that gout and any state of excess uric acid my accelerate OA**
- **This may translate into clinical medicine as less chance of OA development and progression with stricter uric acid control**

Objectives

- Invitro and survey studies have previously documented a positive correlation between asymptomatic hyperurecmia and knee osteoarthritis, however, data from molecular assay studies regarding this topic is scarce.
- The goal of this study is to use a commercially available uric acid assay to retrospectively look at the blood uric acid level in patients who have gone total knee replacement surgery, potentially correlating asymptomatic hyperuricemia as an independent risk factor for knee osteoarthritis, in this case, severe knee arthritis that was significant enough for a total knee replacement.

Results

Ongoing data collection

References

1) Johnson, V. L. & Hunter, D. J. The epidemiology of osteoarthritis. Best Pract. Res. Clin. Rheumatol. 28, 5–15 (2014).
2) Pereira, D., Ramos, E. & Branco, J. Osteoarthritis. Acta Med. Port. 28, 99–106 (2015)
3)Ding, X., Zeng, C., Wei, J., Li, H., Yang, T., Zhang, Y. et al. The associations of serum uric acid level and hyperuricemia with knee osteoarthritis. Rheumatol Int. 2016; 36: 567–573
4)Roddy, E. and Doherty, M. Gout and osteoarthritis: a pathogenetic link?. Joint Bone Spine. 2012; 79: 425–427
5) Howard, R.G., Samuels, J., Gyftopoulos, S., Krasnokutsky, S., Leung, J., Swearingen, C.J. et al. Presence of gout is associated with increased prevalence and severity of knee osteoarthritis among older men: results of a pilot study. J Clin Rheumatol. 2015; 21: 63–71

The Role of Structural Violence in Acute Myeloid Leukemia Outcomes

Ivy Abraham, MD[1], Garth Rauscher, PhD, MPH[1], Anand Ashwin Patel, MD[2], William B Pearse, MD[3], Priya Rajakumar, MD[4], Stephanie Berg, DO[5], Ahmed Aleem, MD[5], Ami Dave, MD[4], Sushma Bharadwaj, MD[6], Koosha Paydary, MD[6], Maria Acevedo-Mendez[1], Richard Gomez[5], Kylie Carlson[5], Stephanie B. Tsai, MD, MS[5], Jessica K. Altman, MD[3], Wendy Stock, MD[2], John G. Quigley[1], Maryam Zia, MD[6], Melissa L. Larson, MD[4] and Irum Khan, MD[1]

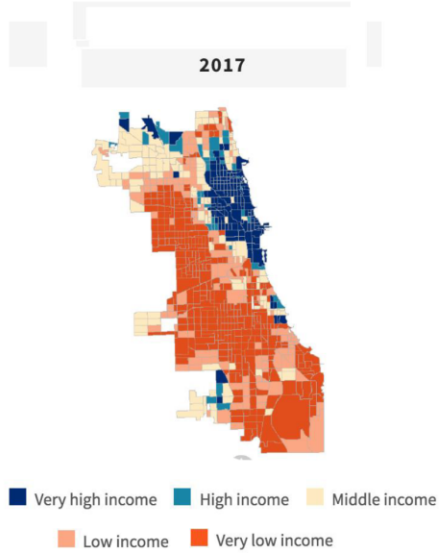
[1]University of Illinois at Chicago, [2]University of Chicago, [3]Northwestern University, [4]Rush University Medical Center, [5]Loyola University Medical Center, [6]John H. Stroger, Jr. Hospital of Cook County

Introduction

- Non-Hispanic Black and Hispanic patients with Acute Myeloid Leukemia (AML) have higher mortality rates than non-Hispanic white (NHW) patients despite lower incidence, more favorable genetics, and a younger age at presentation (Darbinyan, Blood Adv. 2017).
- We performed a multilevel analysis of disparities in AML patients to investigate the contribution of structural violence (neighborhood disadvantage perpetuated by social, economic, and political systems) on racial/ethnic differences in leukemia-specific survival.

Methods

- Adult AML (non-APL) patients diagnosed between 2012 and 2018 at six academic cancer centers in the Chicago area were included.
- Census tract data was collected using the FFIEC Geocoding/Mapping System and computed tract disadvantage and tract affluence scores were categorized into distribution tertiles (low, moderate, high).
- Time to relapse and death from leukemia were examined, adjusting for age, gender and race/ethnicity (baseline models), and for potential mediators of racial disparities including distal (Charlson Comorbidity Index (CCI), obesity, concentrated disadvantage and affluence, health insurance status), and proximal mediators (somatic mutations, and European Leukemia Network (ELN) prognostic score categories).



Maps show average individual income by census tract.

Source: Voorhees Center, University of Illinois at Chicago

Table 1. Patient Characteristics by Race

		nH White (N=497)	nH Black (N= 126)	Hispanic (N= 117)	Other (N=82)	
	N	%	%	%	%	P-value
Age at Diagnosis						<0.0001
18-39	100	10	16	25	13	
40-59	250	31	32	41	32	
60+	412	59	52	34	55	
Gender						0.0004
Male	407	52	42	55	74	
Female	357	48	58	45	26	
Marital Status						<0.0001
Unmarried	293	35	60	43	74	
Married	461	65	40	57	26	
Payer Source						<0.0001
Private	339	51	25	37	44	
Medicare	277	41	39	19	33	
Medicaid	95	6	32	22	10	
Uninsured	50	3	4	23	13	
Enrolled in Clinical Trial						NS
No	624	82	83	87	80	
Yes	128	18	17	13	20	
BMI						<0.0009
Under/normal	257	34	32	29	43	
Over	248	34	32	30	31	
Obese	140	21	13	21	9	
Morbidly Obese	109	11	23	20	16	
ELN Prognostic Group						0.03
Favorable	104	11	18	22	10	
Intermediate	374	51	43	50	51	
Adverse	276	38	39	28	39	
Secondary AML						0.10
No	425	54	49	70	56	
Yes	339	46	51	30	44	
Tract Disadvantage						<0.0001
Low	249	20	56	73	25	
Moderate	246	38	11	32	39	
High	248	16	83	58	30	
Tract Affluence						<0.0001
Low	247	20	56	73	25	
Moderate	249	37	32	16	38	
High	246	43	12	11	38	
p53						0.10
Unmutated	242	88	74	91	84	
Mutated	39	12	26	9	16	
FLT3ITD						NS
Unmutated	641	83	86	86	85	
Mutated	120	17	14	14	15	
NPM1						0.18
Unmutated	550	78	77	87	83	
Mutated	143	22	23	13	17	

NS = non-significant p-value

Table 2. Patient Outcomes

	Induction Chemotherapy | Total (N =822)*			Refractory disease | Induction (N=566)*		ICU | Induction (N=566)$		Relapse | Responders (N=449)*		Transplant | Responders (N=499)*		Death from any cause (N=822)*	
	N	%	P	%	P	%	P	%	P	%	P	%	P
Race/Ethnicity							***				****		
nH White	338	68		16		25		42		69		52	
nH Black	86	68		20		39		43		31		52	
Hispanic	94	80		12		42		39		51		43	
Other/Unknown	56	68		15		51		32		60		46	
Age at Diagnosis			****		***						**		****
18-39	103	96		7		41		45		67		32	
40-59	257	91		13		30		37		66		37	
60+	459	51		23		31		43		49		61	
Tract Disadvantage					*						**		
Low	266	66		14		25		46		66		53	
Moderate	267	71		14		34		37		65		46	
High	265	72		19		37		43		48		51	
Tract Affluence			*		*		**				*		
Low	266	73		21		39		41		51		50	
Moderate	266	73		12		35		44		63		50	
High	265	63		13		21		39		66		50	
Payer Source			****				*				****		*
Private	354	81		15		29		42		72		47	
Medicare	311	90		19		30		47		52		61	
Medicaid	99	83		19		40		33		44		38	
Uninsured	55	85		7		51		43		33		35	
BMI							*						
Under/normal	275	69		18		31		45		62		52	
Overweight	266	64		15		34		43		61		51	
Obese	154	75		13		27		39		60		48	
Morbidly Obese	114	78		13		41		34		51		45	
Charlson Comorbidity Index			****		*		**						****
0	60	97		7		52		48		69		37	
1	158	89		19		33		43		65		39	
2+	300	58		19		30		42		56		60	
ELN Prognostic Group			***		****		*		*		****		****
Favorable	113	83		6		39		49		39		31	
Intermediate	396	71		11		27		36		64		45	
Adverse	301	62		24		36		47		64		64	
Secondary AML			****		****								****
No	474	76		11				41		58		42	
Yes	348	60		24				40		63		61	

****p<0.0001, ***p<0.001, **p<0.01, *p<0.10. $Among all patients receiving treatment. *Among patients receiving induction chemotherapy.

Results

Patient characteristics are shown in Table 1 (n = 822). Significant heterogeneity in age and comorbidities at diagnosis was observed, with Hispanic patients being the youngest and with the lowest CCI. Morbid obesity was more prevalent in NHB and Hispanic (23% and 20%, respectively) compared with NHW (11%) patients. Payer source also differed significantly; private insurance was twice as frequent among NHW than NHB (51% vs. 25%) patients, while the largest uninsured population was Hispanic.

ELN adverse risk disease was most prevalent in NHW subjects, NPM1 mutations were least prevalent in Hispanic patients, and p53 mutations more prevalent in NHB (26%) compared to NHW (12%) and Hispanics (9%) although due to low numbers this did not reach significance (p=0.10). NHB and Hispanic patients tended to reside in more disadvantaged and less affluent areas.

Treatment data was available for 764 patients (Table 2); 75% received intensive induction therapy and choice of first-line treatment did not differ by race or tract disadvantage. Allogeneic transplant rates however differed by race, age, insurance status, tract disadvantage, and ELN score.

Treatment complications of induction chemotherapy, as reflected by ICU admissions during induction, were significantly lower in NHW (25%) compared to NHB (39%) and Hispanic (42%) patients. ICU admission rates were significantly higher in patients with morbid obesity and low tract affluence.

Minority (vs. NHW) ethnicity was associated with a 42% increased hazard of death from leukemia (HR=1.42, 95% CI: 1.09, 1.85), and a 36% increased hazard of death from all causes (HR=1.36, 95% CI: 1.07, 1.72), each after controlling for age, gender and study site.

Adjustment for continuous tract disadvantage and affluence and their interaction lowered both the hazard of leukemia and all cause death to 1.18 (95% CI: 0.88, 1.60) and 1.14 (95% CI: 0.88, 1.49), respectively. In formal mediation analysis, neighborhood SES accounted for 37% (p=0.09) and 50% (p=0.02) of the racial disparity in death from leukemia and all causes, respectively.

Discussion

This study is the first to integrate data at the individual patient level with neighborhood characteristics, using census tract level variables to examine their contribution to AML patient outcomes.

To date, formal mediation methods had not been employed to disentangle race/ethnic disparities in adult AML survival. Notably, our mediation analysis shows that census tract level SES explains a substantial proportion of the disparity in hazard of leukemia death.

In addition, the observed disparities in treatment complications of induction chemotherapy, as reflected by ICU admissions, and the continued disparity in allogeneic transplant utilization all warrant further study. These results draw attention to the need for deeper investigation into the social and economic barriers to successful treatment outcomes for leukemia patients and represent an important first step toward designing strategies to mitigate these persistent health inequities.

References

Karine Darbinyan, Aditi Shastri, Anjali Budhathoki, Daniel Helbig, Rose Snyder, Kith Pradhan, Junaid Saleh-Esa, Noah S. Kornblum, Adam F. Binder, Swati Goel, Murali Janakiram, Olga Derman, Kira Gritsman, Ulrich Steidl, Ira Braunschweig, Amit Verma, Ioannis Mantzaris; Hispanic ethnicity is associated with younger age at presentation but worse survival in acute myeloid leukemia. Blood Adv 2017; 1 (24): 2120–2123.

Correlation of Cellular Indices and D-dimer/Fibrinogen Ratio to Gender Differences in 6-Minute Walk Test Distance in Patients Presenting with Acute Pulmonary Embolism

Nathalie Antonios, MD; Katerina Porcaro, MD; Dalila Masic, PharmD; Sorcha Allen, MD; Alexandru Marginean, MD; Ahmad Manshad, MD; Shannon Kuhrau, PharmD; Ibrahim Chowdhury, PharmD; Karim Merchant, MD; Lucas Chan, MD; Stephen Morris, MD; Jeremiah Haines, DO; Jawed Fareed, PhD; Yevgeniy Brailovsky, DO, MSc; Amir Darki, MD, MSc

Background

- The six-minute walk test (6MWT) is a simple and well-validated test to assess functional status and predict morbidity and mortality in several chronic cardiopulmonary disease states.
- Neutrophil to Lymphocyte ratio (NLR) reflects a pro inflammatory state.
- Increased platelet to lymphocyte ratio (PLR) has been associated with increase in thrombus burden.
- Elevated D-dimer to fibrinogen ratio (D/f) reflects fibrinolysis activation.
- No study has investigated the correlation of these indices with gender differences in 6MWT in patients presenting with pulmonary embolism (PE).
- The objective of this study was to evaluate the gender differences in 6MWT and its impact on outcomes

Baseline Characteristics

Baseline Characteristic	Males (n=236)	Females (n=251)
Age (years), mean ± SD	59 ± 14	62 ± 16
BMI (kg/m^2), mean ± SD	31 ± 8	34 ± 10
Race, n(%)		
White	142 (60.2)	140 (55.8)
Black	68 (28.8)	77 (30.7)
Hispanic	16 (6.8)	17 (6.8)
Other	7 (3.0)	12 (4.8)
Past Medical History, n(%)		
Hypertension	130 (55)	131 (52)
Diabetes	54 (23)	55 (22)
CHF	27 (11)	31 (12)
COPD	21 (9)	17 (7)
CAD	34 (14)	23 (9)
PAD	10 (4.2)	10 (4)
Prior PE	30 (13)	36 (14)
Severity of PE, n (%):		
Massive	15 (6.4)	14 (5.6)
Submassive	140 (59.3)	151 (60.2)
6MWT Distance (95% CI)	764.4 (679.2 to 847.9)	518.9 (460.6 to 577.7)

Methods

- We retrospectively evaluated all acute PE patients from our Pulmonary Embolism Response Team Registry who completed a 6MWT during their initial hospitalization.
- Differential complete blood count data along with d-dimer and fibrinogen were collected within 24 hours prior to PE diagnosis.

Results

Figure 1: 6MWT Distance Based on Gender

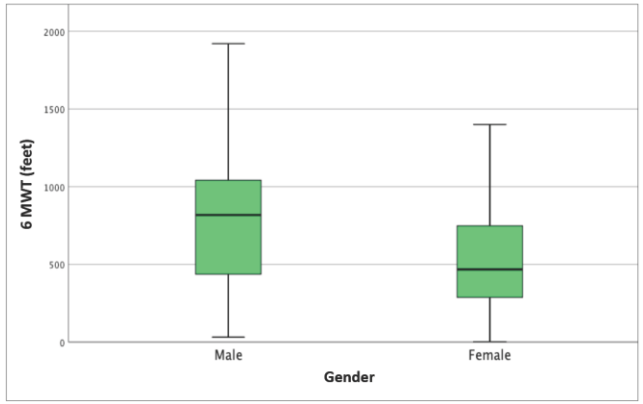


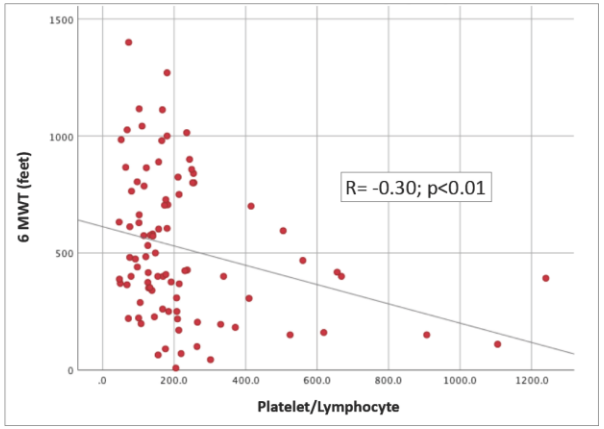
Table 2. Correlation of Neutrophil to Lymphocyte Ratio and 6MWT

		Beta	SE	Std beta	t	P value
Male	Constant	844	68.5		12.3	0.00
	NLR	17.9 ± 1.8	15.9 ± 3.1	-0.19	-1.7	0.09
Female	Constant	17 ± 3.5	14.4 ± 3.4		13.9	0.00
	NLR	14.3 ± 9.7	13.1 ± 8.9	-0.202	-1.93	0.05

No relationship exists that represents possible conflicts of interests with respect to the content of this presentation

Results

Figure 2. Correlation of Platelet to Lymphocyte Ratio and 6MWT



- A total of 186 patients underwent baseline 6MWT and lab tests between March 2016 and January 2020.
- The mean walking distance for males (765 ft) was further than females (519 ft; figure 1).
- Multivariable regression analysis was calculated to investigate predictors of 6MWT in males vs females
- NLR, PLR, and D/f had a negative correlation with walking distance in females (r = -0.20, p <0.05; r = -0.3, p<0.01; and r = -0.15, p<0.05; figure 2)
- NLR, PLR, and D/f did not correlate with 6MWT in males.

Conclusions

- Female patients, in our study, had significantly shorter walking distance after acute presentation in PE.
- This may reflect higher inflammatory and prothrombotic state in females.
- Future studies will need to expand on these findings.

Adherence to ESPEN Guidelines During Inpatient Hospitalization for Alcoholic Hepatitis: a preliminary analysis

Betcher Stephanie, Geraci Patrice, Zhang Tiange, Scaglione Steven
Loyola University Medical Center

Introduction

- In the next decade, Alcohol-associated Liver Disease (ALD) is expected to contribute the largest burden to liver disease in the United States.[1]
- Alcoholic hepatitis (AH) has a high morbidity and mortality, and treatment options are limited.[2,3]
- Protein-calorie malnutrition (PCM) is present in nearly all patients with alcoholic hepatitis and improvement in PCM has been shown to improve survival.[4-6]
- In 2006, the European Society for Clinical Nutrition and Metabolism (ESPEN) developed evidence-based guidelines for nutrition in patients with AH including recommendations on daily energy and protein intake.[4-7]
- Adherence to the ESPEN guidelines remains unclear.
- We hypothesize that patients with severe alcoholic hepatitis who achieve ESPEN recommendations for total calorie intake and protein will have improved clinical outcomes and survival.

Objectives

- To assess adherence to the ESPEN guidelines during inpatient hospitalization of patients with alcoholic hepatitis.
- To explore the association of adherence to ESPEN Caloric and protein goals with clinical outcomes including in-hospital infection, recovery from steatohepatitis, and survival.
- If non-adherence is identified, to determine what barriers there are to adherence and to develop strategies to improve adherence in the future.

Methods

- A clinical research database (CRDB) search was performed that included patients 18 years or older who were hospitalized with severe alcoholic hepatitis between June 1st, 2012 and December 31st, 2020.
- A total of 347 patients met these criteria and were extracted. Each patient's chart was manually reviewed and 103 patients met NIAAA criteria for severe alcoholic hepatitis during our initial review. Variables were collected and entered into Redcap.

Preliminary Results

	Overall N=103(%)	Did not meet ESPEN goals N=89	Met ESPEN goals N=14	p-value
Male % male	65 (63.1)	54(83.1)	11(16.9)	0.19
White	84(81.5)	73(82)	11(78.5)	
Black	4(3.8)	3(3.4)	1(7.1)	0.063
Other	14(13.6)	13(14.6)	1(7.1)	
Hispanic	22 (21.4)	18(20.22)	4(28.6)	
Insurance				0.8
Commercial	2 (1.9)	2(2.25)	0(0)	
Medicaid	53 (51.5)	46(51.7)	7(50)	
Medicare	8 (7.7)	6(6.7)	2(14.3)	
Uninsured/Subsidy	9 (8.7)	8(8.9)	1(7.1)	
Other	31 (30.1)	27(30.3)	4(28.5)	
Facility				
Academic (Loyola)	86 (86.8)	75(88.2)	11(78.5)	0.3
Private (MacNeal/Gottlieb)	13(13.1)	10(11.7)	3(21.4)	
Complications of Cirrhosis				
Ascites	64 (62.1)	54 (60.6)	10(71.4)	0.4
Hepatic Encephalopathy	53 (51.9)	44(50)	9(64.3)	0.5
SBP	7(6.8)	6(6.8)	1(7.1)	0.9
EVBL	10 (9.7)	8(8.9)	2(14.3)	0.1
Hepato-renal syndrome	20 (19.4	18 (20.22)	2(14.3)	0.6
Chronic Opioid Use	3(2.9)	3(0.5)	0(0)	0.5
MELD-Na at Admission (n-103)	30+/-8.6	29.9+/8.3	30.3+/-10.7	0.8
MELD-Na at day 7 (n=97)	30+/-14	30.4+/-1.6	28.9+/-3.5	0.7
mDF	72+/-57.4	69.5+/-5.8	89.3+/-19	0.2
Lille Score – Day7	0.613+/-0.31	0.58+/-0.07	0.78+/-0.09	0.2
Dead	44 (42.7)	39(43.8)	5(35.7)	0.7
Recovery of liver function	34 (33)	29(32.6)	5(35.7)	0.9
OLT	5 (4.8)	5(5.6)	0(0.0)	0.5
Received glucocorticoids	39(37.6)	33(37.1)	6(42.8)	0.6
Nutritional Parameters				
BMI	28.6(6)	28.7+/-6.2	28.6+/-4.9	0.9
IBW female	55.4+/-5.6	55.5+/-5.5	53.6+/-7.4	0.5
IBW Male	70.4+/-7.9	71+/-7.8	67.3+/-7.9	0.1
Est kcal_requirements	2938.2 +/-759	2950+/-792	2860+/-517	0.6
Est protein req female	95.5+/-28.6	95.6+/-29.9	93.8+/-18.6	0.8
Est protein req male	82.4+/-8.6	82.9+/-8.3	80.9+/-10.8	0.6
Nutrition consulted	87 (84.5%)	74(83.1)	13(92.8)	0.3
Dietary supplements ordered	41 (39.8)	37(41.6)	4(28.5)	0.04

Table 1: Baseline Characteristics of patients with severe alcoholic hepatitis and among those who met ESPEN goals.
OLT=Orthotopic liver transplantation; SBP=spontaneous bacterial peritonitis; EVBL=esophageal variceal bleeding; MELD-NA=Model for end-stage liver disease; Mean ± standard deviation or count (percentage)

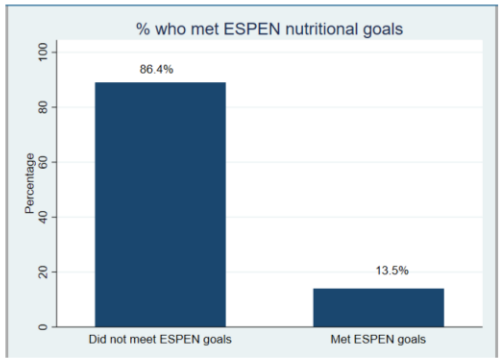


Figure 1: Percent of patients who met ESPEN Nutrition Goals

	Dead N=44	Alive n=59	p-value
Sex:			0.6
Female	15 (39.5)	23(60.5)	
Male	29 (44.6)	36(55.4)	
White			
Race			0.12
White	40(90.9)	44(74.6)	
Black	0(0.0)	4(6.7)	
Other	4(9.1)	10(16.9)	
Hispanic	7(15.9)	15(25.4)	0.2
Insurance			0.12
Commercial	0(0)	2(3.4)	
Medicaid	21(47.7)	32(54.2)	
Medicare	1(2.2)	7 (11.8)	
Uninsured/Subsidy	5(11.3	4(6.7)	
other	17 (38.6)	14(23.7)	
Facility			0.03
Academic (Loyola)	40(95.2)	46(80.7)	
Private (Macneal/Gottlieb)	2(4.7)	11(19.3)	
Complications of Cirrhosis			
Ascites	33(75)	31(52.5)	0.02
Hepatic Encephalopathy	26(60.4)	27 (45.7)	0.15
SBP	3(6.8)	4(6.9)	0.9
EVBL	6(13.6)	4(6.7	0.3
Hepato-renal syndrome	11(25)	9(15.25)	0.3
Chronic Opioid Use	2(4.5)	1(1.7)	0.7
MELD-Na at Admission (n-103)	32.9+/-8.0	27.8+/-8.5	0.01
MELD-Na at day 7 (n=97)	35.9 +/-17.8	25.9 +8.9	0.001
mDF	88 +/-52.6	59.9+/-58.2	0.01
OLT			
Received glucocorticoids	20(45.4)	19(32.2)	0.17
Nutritional Parameters			
BMI	29.7 +/-6.4)	27.8+/-5.7	0.1
IBW female	55.4 +/-6.9	55.4+/-4.7	0.9
IBW Male	71.3 +/-8.4	69.5 +/-7.5	0.4
Est kcal_requirements	3099.5 +/-894	2820.7+/-626	0.06
Est protein req female	101.5 +/- 34.4	91.2+/-	0.11
Est protein req male	80.5 +/-7.3	83.9 +/- 9.6	0.32
Nutrition consulted	39 (88.6)	48 (81.4)	0.3
Dietary supplements ordered	19 (43.2)	22(37.3)	0.7

Table 2: Clinical characteristics of patients with severe alcoholic hepatitis by death

Preliminary Conclusions

- 86.4% of patients did not meet ESPEN nutritional goals during their inpatient hospitalization for alcoholic hepatitis
- The identification of barriers to adherence may serve as actionable targets for future quality improvement efforts.
- Further data collection and analysis needs to be performed to further inform how nutrition impacts the natural history of severe alcoholic hepatitis

References

1. Guirguis J, Chhatwal J, Dasarathy J, et al. Clinical impact of alcohol-related cirrhosis in the next decade: estimates based on current epidemiological trends in the United States. *Alcohol Clin Exp Res*. 2015;39(11):2085-2094. doi:10.1111/acer.12887
2. Lourens S, Sunjaya DB, Singal A, et al. Acute Alcoholic Hepatitis: Natural History and Predictors of Mortality Using a Multicenter Prospective Study. *Mayo Clin proceedings Innov Qual outcomes*. 2017;1(1):37-48. doi:10.1016/j.mayocpiqo.2017.04.004
3. Hughes E, Hopkins LJ, Parker R. Survival from alcoholic hepatitis has not improved over time. *PLoS One*. 2018;13(2):e0192393. doi:10.1371/journal.pone.0192393
4. Mendenhall C, Roselle GA, Gartside P, Moritz T. Relationship of protein calorie malnutrition to alcoholic liver disease: a reexamination of data from two Veterans Administration Cooperative Studies. *Alcohol Clin Exp Res*. 1995;19(3):635-641. doi:10.1111/j.1530-0277.1995.tb01560.x
5. Mendenhall CL, Anderson S, Weesner RE, Goldberg SJ, Crolic KA. Protein-calorie malnutrition associated with alcoholic hepatitis. Veterans Administration Cooperative Study Group on Alcoholic Hepatitis. *Am J Med*. 1984;76(2):211-222. doi:10.1016/0002-9343(84)90776-9
6. Mendenhall CL, Tosch T, Weesner RE, et al. VA cooperative study on alcoholic hepatitis II: Prognostic significance of protein-calorie malnutrition. *Am J Clin Nutr*. 1986;43(2):213-218. doi:10.1093/ajcn/43.2.213
7. Plauth M, Cabré E, Riggio O, et al. ESPEN Guidelines on Enteral Nutrition: Liver disease. *Clin Nutr*. 2006;25(2):285-294. doi:10.1016/j.clnu.2006.01.018

LOYOLA HEALTH SCIENCES DIVISION

The Utility of EndoFLIP in Determining Therapeutic Intervention: A Tertiary Center Experience

Lauren Bloomberg[1], Arouj Bajwa[1], Matthew Hoscheit[2], Nikhil Shastri[2], Brian Liem[2], Mukund Venu[2]

1 Department of Internal Medicine, Loyola University Medical Center; 2 Division of Gastroenterology, Loyola University Medical Center

INTRODUCTION

- FLIP (Functional Lumen Imaging Probe) is a diagnostic tool used to evaluate esophageal motility disorders (EMD)
- Following endoscopy, a catheter with an inflatable balloon is inserted into the esophagus and expanded
- FLIP utilizes high-resolution impedance planimetry during volume-controlled balloon distension to measure cross sectional area (CSA) and esophageal distensibility
- Rapid assessment of esophageal mechanical properties and opening dynamics of esophagogastric junction (EGJ) provide useful insight into the diagnosis of EMD

AIMS

- Evaluate the utility of EndoFLIP in predicting endoscopic or surgical interventions performed in patients with EMD

METHODS

- Retrospective cohort study of 149 patients undergoing FLIP at LUMC between 2018-2020
- EMR utilized for patient demographics, FLIP metrics and post-FLIP esophageal interventions
- Distensibility index (DI) and CSA were evaluated at 30mL, 40mL, 50mL, 60mL, 70mL
- Abnormal FLIP was defined by retrograde, aberrant or absent esophageal body peristalsis and EGJ-DI <2.8mm^2/mmHg
- Primary outcome: proportion of surgical and endoscopic esophageal intervention in patients with abnormal FLIP compared to those with normal FLIP

RESULTS

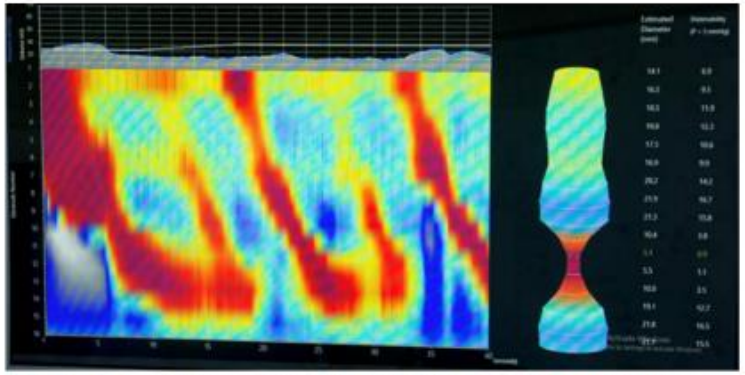


Figure 1. FLIP topography demonstrating low DI & CSA at the EGJ with intact esophageal body motility at 40mL, suggestive of EGJ outflow obstruction.

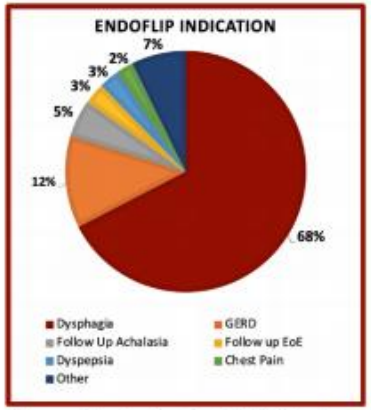


Figure 2. Indication for FLIP. "Other" includes bloating, eructation, odynophagia, therapy of achalasia, achalasia post-POEM, chronic cough, globus sensation, and achalasia.

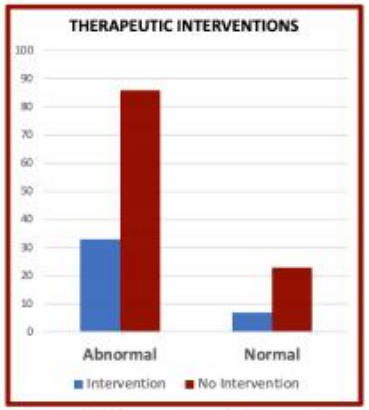


Figure 3. Comparison of intervention between patients with normal and abnormal FLIP results. X^2 (1, N=149) = 0.236, p=0.627.

RESULTS

- 149 FLIPs were performed at LUMC from 2018-2020
- Mean patient age was 58 years old. 61% women and 38% men
- Mean symptom duration prior to FLIP was 61 months
- Dysphagia was most common indication for FLIP (68%)
- 119 patients had abnormal FLIP. 33 patients (27.7%) had an endoscopic or surgical intervention for EMD within 3 years
- 30 patients had normal FLIP results. 7 patients (23.3%) had an endoscopic or surgical intervention for EMD within 3 years after FLIP
- Comparison of intervention between patients with normal and abnormal FLIP showed no significant difference. X^2 (1, N=149) = 0.236, p=0.627

CONCLUSION

- Patients with abnormal FLIP trended towards increased surgical or endoscopic therapies for EMD than those with normal FLIP, though this trend was not significant
- 7 of 30 (23.3%) patients with normal FLIP underwent intervention, suggesting the implication of a normal FLIP remains to be fully understood
- Impact of prior intervention, loss to follow up and deferral of intervention in patients with abnormal FLIP was apparent and should be considered
- Correlation of FLIP metrics with high resolution manometry, timed barium esophagram and endoscopy is an area of ongoing research and requires further study

Optimization of Allergy History and Time of Antibiotic Delivery for Febrile Neutropenia

Alissa Chandler, MD
Hines VA Medical Center and Loyola University Medical Center

LOYOLA HEALTH SCIENCES DIVISION

(1) Background & Problem Statement

• High risk patients with febrile neutropenia presenting to the ER require prompt therapeutic intervention. Systems to gather complete and accurate allergy history can provide a safety check and avoid delays in treatment, which could possibly affect overall patient outcomes.

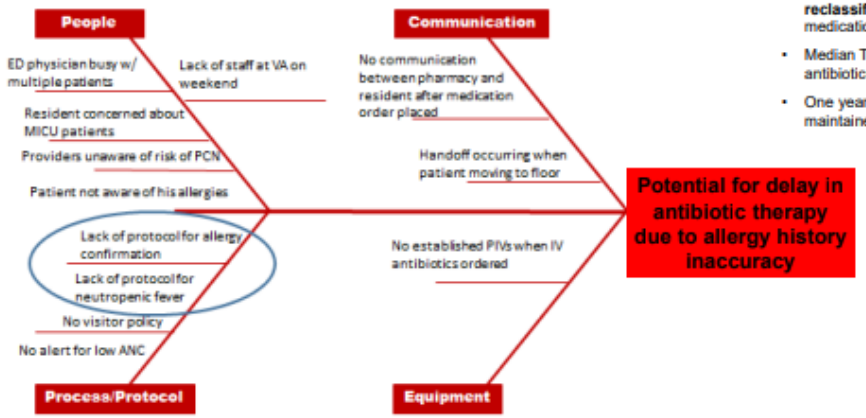
•**Adverse drug reactions (ADR)** are common in the inpatient setting

- Up to 20% of inpatients have an ADR, and 10-15% of hospitalized patients have antibiotic allergy.
- Patients with antibiotic allergies have increased length of stay, higher cost of hospitalization and higher rates of resistant infections
- There are **no standardized** ways to collect allergy history
- Storage and presentation of allergy history in EMR can affect our actions

•**Febrile neutropenia (FN)** is an **oncology emergency** with high mortality

- Defined as temperature >38.3 C once or >38 C for 1 hour and ANC < 500
- Standard treatment at our institution is meropenem, however this is contraindicated in patients with severe penicillin allergy.
- **In hospital mortality for FN estimated 9.5%**
- In patients >age 65, mortality increased to 12.5%. This is **higher** than mortality seen in STEMI, NSTEMI, stroke, pneumonia, all estimated < 10 % in various studies
- Time to antibiotics of 60 minutes is goal for treatment, like sepsis goals
- Unclear how this affects mortality, but many sites have protocols for treatment of FN to improve time to antibiotics
- Protocols need to be easily accessible to be useful

(2) Fishbone Diagram



(3) Discussion – Adverse drug reactions

Standardizing how we collect adverse drug reaction (ADR) history with questionnaire

- QI project used questionnaire (Fig 1) to assess ADR history in patients admitted to hospital with documented allergy. They analyzed for clinically significant changes in patient's allergy list
- 61% of the 202 patients had clinically significant changes, most commonly adding a description.
- Better accuracy of allergy description could improve utility of information

EMR interaction with ADR data can vary in quality

- EMR display of allergies at time of event was cumbersome, did not readily display type of reaction to drug on alert page.
- No hard stop in VA system to confirm ADR prior to ordering potentially harmful medications
- Other EMR systems such as Epic can include **hard stop**, requiring confirmation of allergies on separate page prior to placing ANY medication order (Fig. 2)

Figure 1: ADR history questionnaire

Figure 2: Warning message that allergies must be reviewed prior to order being signed

(4) Discussion- Febrile neutropenia protocols

Ways to reduce **time to antibiotics (TTA)** from ED for febrile neutropenia

- Study from Cleveland Clinic implemented 8 measures in ED to reduce TTA, including **reclassifying severity** to MI/CVA equivalent, making **standardized order set** for medications and giving **antibiotics before CBC** returned.
- Median TTA improved from 235 minutes to 81 minutes, with 57% receiving antibiotics in < 90 minutes (Fig 3)
- One year after study period closed, even without further interventions, the TTA was maintained at < 90 min for patients presenting to the ED with febrile neutropenia

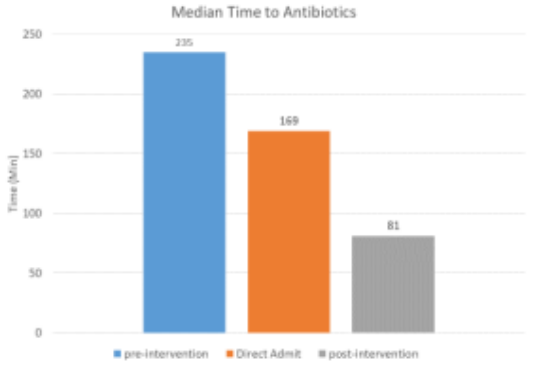
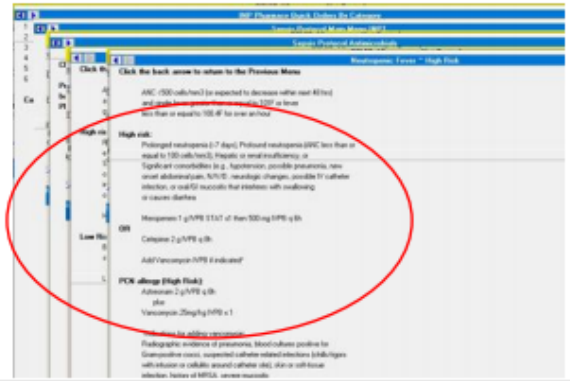


Figure 3: Median TTA in pre-intervention ED patients, direct floor admit patients, and post-intervention ED patients

Protocols can be useful to standardize antibiotics used for treatment, if easily accessible

- Loyola and VA protocols designed by Heme/onc and Infectious disease departments **difficult to find**, and many house staff don't know about them
- Standardized order set in CPRS **hidden** in sepsis orders. Have to go through 5 separate pages to get to it.



(5) Next Steps

Improve adverse drug reaction history collection and presentation of data in CPRS

- Integrate allergy questionnaire into outpatient visits as part of nurse visit or reminders
- Include allergy confirmation or acknowledgment in admission order set to improve recognition and confirmation of clinically significant allergies.
- ED and hospital pharmacists already taking active role in "cleaning" antibiotic allergies/ADR that are not clinically significant.

Improve recognition of febrile neutropenia and time to antibiotics in ED patients

- Consider febrile neutropenia alert cards for high risk patients on chemotherapy
- Change ED triage score for febrile neutropenia or fever in patient receiving chemotherapy to higher severity
- Make febrile neutropenia protocol a separate order set tab from sepsis protocol
- Have antibiotics available in ED for prompt administration

(6) References

1. Moran, R., Dewchand, M., Smibert, O., and Trubiano, J. A. (2019) Antibiotic allergy labels in hospitalized and critically ill adults: A review of current impacts of inaccurate labelling. *Br J Clin Pharmacol*, 85: 492– 500. https://doi.org/10.1111/bcp.13830.
2. Harig A, Rybarczyk A, Benedetti A, Zimmerman J. Clarification of Drug Allergy Information Using a Standardized Drug Allergy Questionnaire and Interview. *P T*. 2018;43(8):480-504.
3. Kuderer, N.M., Dale, D.C., Crawford, J., Cosler, L.E. and Lyman, G.H. (2006), Mortality, morbidity, and cost associated with febrile neutropenia in adult cancer patients. Cancer, 106: 2258-2266. doi:10.1002/cncr.21847
4. Waterer GW, Self WH, Courtney DM, et al. In-Hospital Deaths Among Adults With Community-Acquired Pneumonia. Chest. 2018; 154(3):628-635. doi:10.1016/j.chest.2018.05.021
5. Stepanova M, Venkatesan C, Altaweel L, Mishra A, Younossi ZM. Recent trends in inpatient mortality and resource utilization for patients with stroke in the United States: 2005-2009. J Stroke Cerebrovasc Dis. 2013 May;22(4):491-9. doi: 10.1016/j.jstrokecerebrovasdis.2013.03.005. Epub 2013 Mar 30. PMID: 23545319
6. Connors AF Jr, Dawson NV, Thomas C, et al. Outcomes following acute exacerbation of severe chronic obstructive lung disease. The SUPPORT investigators (Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments) [published correction appears in Am J Respir Crit Care Med 1997 Jan;155(1):386]. *Am J Respir Crit Care Med*. 1996;154(4 Pt 1):959-967. doi:10.1164/ajrccm.154.4.8887592
7. Koenig C, Schneider C, Morgan JE, Ammann RA, Sung L, Phillips B. Interventions aiming to reduce time to antibiotics (TTA) in patients with fever and neutropenia during chemotherapy for cancer (FN), a systematic review. *Support Care Cancer*. 2020;28(5):2369-2380. doi:10.1007/s00520-019-05056-w
8. Keng MK, Thallner EA, Elson P, et al. Reducing Time to Antibiotic Administration for Febrile Neutropenia in the Emergency Department. *J Oncol Pract*. 2015;11(6):450-455. doi:10.1200/JOP.2014.002733
9. Daniels, L. M., Durani, U., Barreto, J. N., O'Horo, J. C., Siddiqui, M. A., Park, J. G., & Tosh, P. K. (2019). Impact of time to antibiotic on hospital stay, intensive care unit admission, and mortality in febrile neutropenia. Supportive Care in Cancer. doi:10.1007/s00520-019-04701-8
10. Freifeld AG, Bow EJ, Sepkowitz KA, et al. Clinical practice guideline for the use of antimicrobial agents in neutropenic patients with cancer: 2010 update by the Infectious Diseases Society of America. Clin Infect Dis 52:e56-e93, 2011

Efficacy of Early Push Enteroscopy in LVAD Patients with Upper GI Bleeding

Andrew Choi MD [1], Thomas Konturek MD [2], Abdul Haseeb MD, MPH [2]
[1]Department of Internal Medicine, Loyola University Medical Center, Maywood, IL
[2]Division of Gastroenterology and Nutrition, Loyola University Medical Center, Maywood, IL

Introduction

- Heart failure is a progressive and chronic disease afflicting approximately 5.8 millions adults in the United States
- Continuous Flow (CF) LVADs have become the standard of care for patients when candidacy for transplantation is deferred, either as Bridge to Transplant (BTT) or as Destination Therapy (DT)
- CF-LVADs have been shown to improve survival when compared to Pulsatile Flow LVADs. However, CF-LVADs concomitantly increase the risk of GI bleeding thought secondary to a complex pathophysiologic process
- Angiodysplasia is the most common cause of GI bleeding in LVAD patients, accounting for around 40% of all bleeding events. Typically, these angiodysplasias in LVAD patients are found in the upper and middle GI tract
- Prior single center studies suggest that an initial approach with push enteroscopy lead to higher diagnostic and therapeutic yields due to the typical location of angiodysplasias in this population

Aim

- We hypothesize that the use of push enteroscopy (PE) as the initial endoscopic procedure in CF-LVAD patients presenting with Upper GI Bleeding (UGIB) leads to a higher diagnostic and therapeutic yield as compared to EGD or EGD/Colonoscopy

Methods

- Single-center retrospective cohort study
- Study period: 7/6/2010 to 12/15/2020
- Inclusion Criteria: Age >18; CF-LVAD (HMII or HVAD), admission for Upper GI Bleeding
- Primary outcome: Diagnostic and Therapeutic Yield of Endoscopy
- Secondary outcomes: 30-day readmission rate for GI bleeding, hospital length-of-stay, total number of endoscopic procedures, total number of blood product requirements

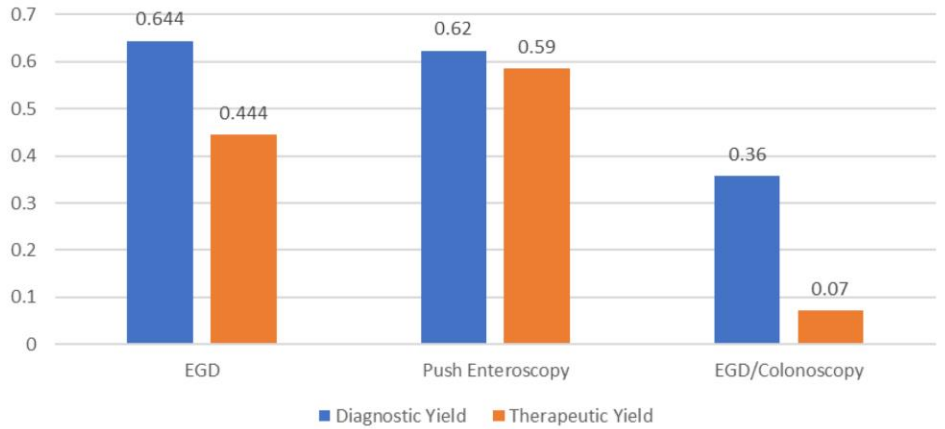
Table 1: Demographics

Total Number of Patients	64
Sex	
- Male	50 (78%)
- Female	14 (22%)
Type of LVAD Therapy	
- BTT	31 (48%)
- DT	33 (52%)
Total Admissions for GI Bleed	201
Type of GI Bleeding	
- Upper	140 (69.7%)
- Occult	23 (11.4%)
- Lower	38 (18.9%)

Table 2: Type of First Endoscopy in Upper GI Bleed

EGD	45 (32.1%)
Push Enteroscopy (PE)	53 (37.9%)
EGD/Colonoscopy	14 (10.0%)
EGD/VCE	6 (4.3%)
Push/VCE	5 (3.6%)
EGD/Colonoscopy/VCE	5 (3.6%)
VCE	3 (2.1%)
Balloon Assisted Enteroscopy	1 (0.7%)
Not Performed	3 (2.1%)

Figure 1: Diagnostic and Therapeutic Yields of Endoscopy



Results

- A total of 140 admissions for Upper GI Bleeding and the initial choice of endoscopy were reviewed
- EGD had a diagnostic yield of 64.4% as compared to 62% for PE and 36% for combined EGD/Colonoscopy
- PE had a therapeutic yield of 59% as compared to 44% for EGD and 7% for combined EGD/Colonoscopy

Conclusions

- The use of EGD as initial endoscopy in CF-LVAD patients with UGIB resulted in a higher diagnostic yield as compared to PE or combined EGD/Colonoscopy
- However, the use of PE had a higher therapeutic yield as compared to other modalities
- Additional studies will be necessary to further elucidate the role of early push enteroscopy in LVAD patients presenting with UGIB

References

- Axelrad JE, Pinsino A, Trinh PN, et al. Limited usefulness of endoscopic evaluation in patients with continuous-flow left ventricular assist devices and gastrointestinal bleeding. J Heart Lung Transplant. 2018;37(6):723-732. doi:10.1016/j.healun.2017.12.017
- Marsano, J., Desai, J., Chang, S., Chau, M., Pochapin, M., & Gurvits, G. E. (2015). Characteristics of gastrointestinal bleeding after placement of continuous-flow left ventricular assist device: a case series. Digestive diseases and sciences, 60(6), 1859–1867. https://doi.org/10.1007/s10620-015-3538-7
- Sarosiek, K., Bogar, L., Conn, M. I., O'Hare, B., Hirose, H., & Cavarocchi, N. C. (2013). An old problem with a new therapy: gastrointestinal bleeding in ventricular assist device patients and deep overtube-assisted enteroscopy. ASAIO journal (American Society for Artificial Internal Organs : 1992), 59(4), 384–389. https://doi.org/10.1097/MAT.0b013e318299fcd3

Machine Learning Prediction of Pulmonary Embolism Mortality

LOYOLA UNIVERSITY CHICAGO HEALTH SCIENCES DIVISION

Matthew Colllins[1], Ahmad Manshad[2], Nicolas Krepostman[1], Josh Newman[2], Sorcha Allen[2], Muhanad Manshad[3], Oguz Akbilgic[4], Jawed Fareed[5], Amir Darki[2]

[1]LUMC, Dept. of Internal Medicine, [2]LUMC, Dept. of Cardiology, [3]University of Northern Colorado, Dept. of Computer Information Systems, [4]LUMC, Dept. of Health Informatics and Data Science, [5]LUMC, Cardiovascular Research Institute

Introduction

- Acute pulmonary embolism (PE) is a common, life threatening complication of venous thromboembolism
- Incidence of VTE is 23 to 69 cases per 100,000 persons annually in the United States.[1]
- Mortality varies significantly depending on severity of disease, with low-risk patients predicted to have a 30-day mortality rate of 2.3%, compared to 11.4% in high-risk patients.[2]
- Current risk stratification tools lack lack positive predictive ability.[5,10]
- Machine learning (ML) is a methodology that incorporates developmental processes to recognize complex patterns for aiding in making rational decisions.[7] In clinical practice, machine learning algorithms have been designed to routinely and accurately predict prognosis based on large volumes of patient information. [8,9]
- The aim of this study was to create a machine learning instrument to predict 30-day all-cause mortality in patients diagnosed with acute PE.

Methods

- Utilizing ML algorithms, predictors of 30-day all-cause mortality were compared to conventional risk stratification models, PE severity index (PESI) and its simplified version (sPESI).
- (XGBoost), gradient boosting machine (GBM), random forest (RF), deep neural networks (DNN) and generalized linear models (GML) ML algorithms were included
- Finalized ML models were compared to each other, as well as reference models PESI and sPESI, using receiver operating characteristic (ROC) curves.
- 10 most important predictor variables in our dataset for 30-day mortality were identified based on decreases in accuracy by exclusion of each specific variable.
- Classification performance of the truncated XGBoost models were compared on ROC curves.

Results

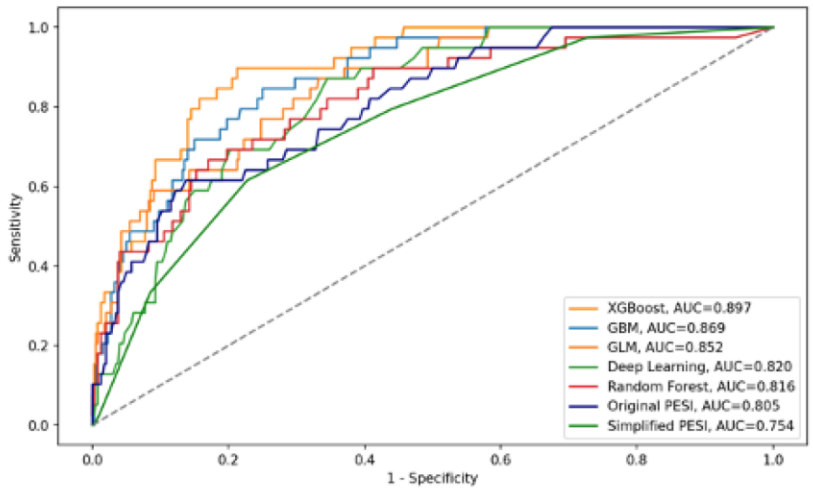


Figure 1. AUC of XGBoost compared to other machine learning models, as well as PESI and sPESI

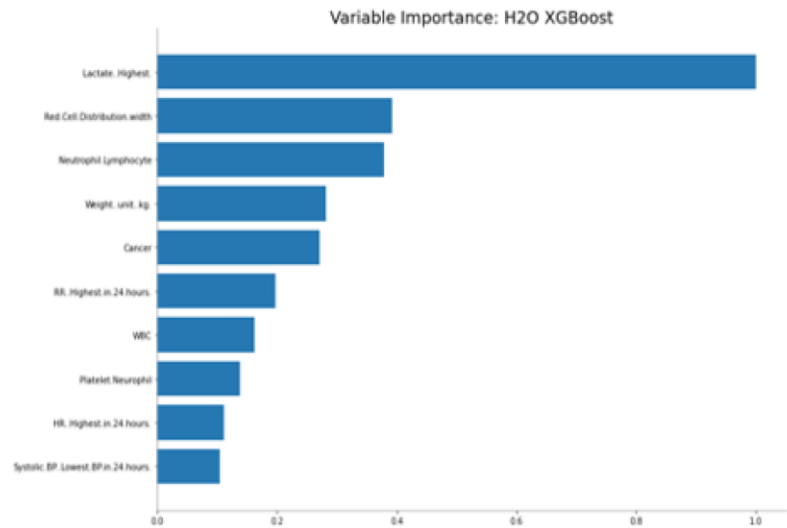


Figure 2. Relative importance of the top 10 most important variables in XGBoost's prediction algorithm

Discussion

- In the available literature, our XGBoost ML algorithm represents the first ML program to predict 30-day PE mortality.
- XGBoost can be used at point of contact without a need to access prior medical history or integrate the algorithm into one's EMR, like the most commonly used algorithms PESI and sPESI, but with a superior AUC, sensitivity, specificity, and accuracy.
- XGBoost uses traditional, well understood markers of PE severity (lactate & respiratory rate) as well as new, less well understood ones (Red Cell Distribution Width & Neutrophil/Lymphocyte Ratio)
  - Lactate → tissue hypoperfusion, shock, RV failure
  - Respiratory Rate → acidosis, pulmonary mechanoreceptor stress and activation
  - RDW → increased in situations of high inflammation, particularly in the setting of concomitant RAAS activation, RV failure, and worsened lung function
  - NLR → inflammatory marker that is increased by adrenaline and glucocorticoid release seen in severe PE that may have an association with platelet activation, PE propagation, and worsening PE severity
- Conclusion: Compared to conventional risk stratification models, XGBoost and other ML models demonstrated a superior ability to predict short-term all-cause mortality in patients with acute PE.
- Limitation: without external validation, our model remains unproven, and is our next step in its development.

References

1. Anderson FA. A Population-Based Perspective of the Hospital Incidence and Case-Fatality Rates of Deep Vein Thrombosis and Pulmonary Embolism. *Archives of Internal Medicine*. 1991;151(5):933. doi:10.1001/archinte.1991.00400050081O1
2. Goldhaber SZ, Visani L, de Rosa M. Acute pulmonary embolism: clinical outcomes in the International Cooperative Pulmonary Embolism Registry (ICOPER). *The Lancet*. 1999;353(9162):1386-1389. doi:10.1016/S0140-6736(98)07534-5
3. Jiménez D. Simplification of the Pulmonary Embolism Severity Index for Prognostication in Patients With Acute Symptomatic Pulmonary Embolism. *Archives of Internal Medicine*. 2010;170(15):1383. doi:10.1001/archinternmed.2010.199
4. Zhou X-Y, Ben S-Q, Chen H-L, Ni S-S. The prognostic value of pulmonary embolism severity index in acute pulmonary embolism: a meta-analysis. *Respiratory Research*. 2012;13(1):111. doi:10.1186/1465-9921-13-111
5. Shafiq A, Lodhi H, Ahmed Z, Bajwa A. Is the Pulmonary Embolism Severity Index Being Routinely Used in Clinical Practice? *Thrombosis*. 2015;2015:1-5. doi:10.1155/2015/17535
6. Candeias Faria D, Freitas P, Simoes J, et al. P5018Prognosis of pulmonary embolism 30-day mortality risk based on five admission parameters: the PoPE score. *European Heart Journal*. 2019;40(Supplement_1). doi:10.1093/eurheartj/ehz746.0196
7. Benkol G, Kula S, Yildiz O. Machine Learning Techniques in Diagnosis of Pulmonary Embolism. J Clin Anal Med 2015;6(suppl 6): 729-32.
8. Akbilgic O, Obi Y, Potukuchi PK, et al. Machine Learning to Identify Dialysis Patients at High Death Risk. *Kidney International Reports*. 2019;4(9):1219-1229. doi:10.1016/j.ekir.2019.06.009
9. Jordan M.I., Mitchell T.M. Machine Learning: Trends, perspectives, and prospects. *Science*. 17 Jul 2015:Vol. 349, Issue 6245, pp. 255-260 DOI: 10.1126/science.aaa8415.
10. Liang J, Bi J. Computer aided detection of pulmonary embolism with tobogganing and mutiple instance classification in CT pulmonary angiography. Inf Process Med Imaging. 2007;20:630-41. doi: 10.1007/978-3-540-73273-0_52. PMID: 17633735
11. Banerjee I, Sofela M, Yang J, Chen JH, Shah NH, Ball R, Mushlin AI, Desai M, Bledsoe J, Amrhein T, Rubin DL, Zamanian R, Lungren MP. Development and Performance of the Pulmonary Embolism Result Forecast Model (PERFORM) for Computed Tomography Clinical Decision Support. JAMA Netw Open. 2019 Aug 2;2(8):e198719. doi: 10.1001/jamanetworkopen.2019.8719. PMID: 31390040; PMCID: PMC6686780.

Impact of Meropenem De-escalation on Outcomes of Febrile Neutropenia Patients

Hina Dalal, DO, Austin Fan, MD, Maressa Santorossa, PharmD, Fritzie Albarillo, MD, Stephanie Tsai, MD
Loyola University Medical Center, Edward Hines, Jr. V.A. Hospital

Background

Numerous studies have shown clinical benefits and lack of adverse effects when patients with febrile neutropenia are de-escalated from broad to narrow-spectrum antibiotics.

Ford et al. demonstrated longer lengths of stay, durations of severe neutropenia and 10% higher hospital cost in patients receiving empiric carbapenem over cefepime or pipercillin/tazobactam.

Aguilar-Guisado et al. illustrated that antibiotic de-escalation in febrile neutropenia with negative infectious work-up before absolute neutrophil count recovery was associated with a lower risk of recurrent fever and had no impact on adverse drug events, ICU transfer, and in-hospital mortality.

Per the pharmacy and therapeutics committee, the most common empiric antimicrobial used for febrile neutropenia at LUMC is meropenem and it is generally not appropriately de-escalated, even when recommended by the infectious diseases team.

Objective

The purpose is to conduct a retrospective review evaluating outcomes after appropriate de-escalation of meropenem among patients with neutropenic fever for non-inferiority, demonstrating that de-escalation is not associated with poorer outcomes.

Methods and Outcomes

- ICD-10 coded febrile neutropenia in Hematology/BMTU patients at LUMC from November 2019 to November 2020 with the following diagnoses:
  - Acute lymphoblastic leukemia
  - Acute myeloblastic leukemia
  - Aplastic anemia
  - Multiple myeloma
  - Myelodysplastic syndrome
  - Hodgkin or non-Hodgkin lymphoma
  - Autologous or allogeneic stem cell transplant
- Exclusion criteria:
  - <18 years of age
  - Clinically does not meet definition of febrile neutropenia
  - Did not receive meropenem for ≥ 48 hrs
  - Received treatment with vasopressors
  - No diagnosis of hematological malignancy

Outcomes	
Primary measure	Rate of appropriate Meropenem de-escalation
Process measures	Meropenem days of therapy (DOT)
	Frequency of ID consultation
Balancing measures	Rate of *C. difficile* infection
	ICU transfer
	Length of stay
	Fever recurrence
	Mortality

Initial Intervention

- In July 2019 LUMC P&T committee creates antibiotic de-escalation algorithm for febrile neutropenia, however it has poor uptake into clinical practice
- Barriers include:
  - Varying physician preference regarding timing the de-escalation of antibiotics
  - Lack of clinician awareness of implemented de-escalation algorithm
  - Clinician preference on consulting ID to assist in managing febrile neutropenia
  - Pharmacy has protocol for Meropenem approval, but de-escalation is dependent on the primary provider.

Gap Analysis

- PDSA cycle for initial algorithm demonstrated the need for attendings to agree with antibiotic de-escalation for practice to be adopted
- Redesign study from ‘pre vs post algorithm’ to ‘de-escalation vs continuation of meropenem’ to show non-inferior, and perhaps improved, outcomes in febrile neutropenia patients
- Thus, facilitate hematology implementing early de-escalation at LUMC followed by adoption of practice by medical trainees

References

- Ford, CD. *Infect Control Hosp Epidemiol*. 2019 Jul;40(7):774-779
- Aguilar-Guisado, M. *Lancet Haematol*. 2017 Dec;4(12):e573-e583
- Van de Wyngaert, Z. *Int J Antimicrob Agents*. 2019 Jun;53(6): 781-788

Efficacy of Contact Precautions in Controlling the Spread of MRSA and VRE

Sovik De Sirkar, MD; Laura Miller, MPH; David Slade, MD, JD
Loyola University Medical Center

Background

Contact precautions (CP) are physical safeguards such as disposable gowns and gloves that limit any direct physical contact between patients and providers. The Centers for Disease Control and Prevention (CDC) recommends using contact precautions for vancomycin-resistant enterococcus (VRE) and methicillin-resistant staphylococcus aureus (MRSA)-colonized or infected patients to limit the spread of these infections[1].

The original studies that demonstrated the efficacy of contact precautions for limiting the spread of MRSA and VRE infections, however, were likely confounded by other factors such as improved hand hygiene, chlorhexidine bathing, and active surveillance cultures[2]. Several pilot studies at other institutions have since found contact precautions do not decrease the spread of these infections[3].

Furthermore, contact precautions can be costly, increase the time it takes for medical teams to make their daily rounds, and decrease the overall time healthcare providers spend with their patients. Less interaction with providers has been linked to an increased incidence of falls and pressure ulcers[4,5].

In March 2020, Loyola University Medical Center (LUMC) suspended the mandate to use contact precautions to treat patients with MRSA and VRE as a measure to preserve personal protective equipment for the Covid-19 pandemic.

Objectives

To determine if the suspension of contact precautions led to a statistically significant increase in the rate of healthcare-acquired MRSA and VRE infections, or MRSA nares colonization, at LUMC.

To determine if the suspension of contact precautions led to a decrease in the percentage of LUMC patients with healthcare-acquired MRSA and VRE infections experiencing new falls or pressure ulcers.

Methods

This was a retrospective Quality Improvement (QI) study of patients admitted to LUMC between May 2019 to January 2020 and May 2020 to January 2021. The interim period was not evaluated as this was the start of the Covid-19 pandemic and the use of CP was in flux.

A Loyola clinical QI analyst utilized Microsoft SQL to connect to the electronic medical record and MedMined to extract all pertinent data. This included the number of monthly healthcare-associated infections, MRSA nares colonizations, and documented falls and pressure ulcers.

MedMined is a local database that houses all of Loyola's infectious disease data, which is populated monthly by the Infection Control team.

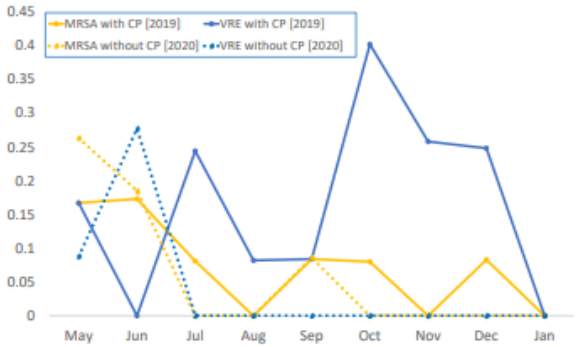
Healthcare-associated infections (HAI) are defined as infections that occur on or after the 3rd day of admission and meet certain site-specific infection criteria. HAI generally describe infections related to the use of central lines, indwelling urinary catheters, ventilators, or surgical site infections[6].

Results

The monthly HAI rate per 1,000 patient days is displayed in *Figure 1* below, with the solid lines illustrating the rates with the use of contact precautions, and the dotted lines representing the same rate year-over-year after their suspension.

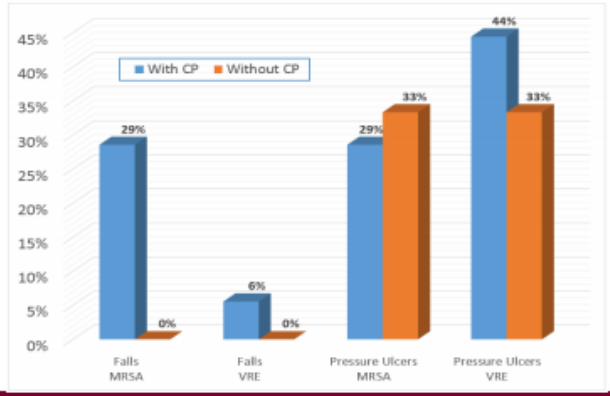
HAI MRSA rates without the use of contact precautions were the same or lower in a month-to-month comparison in 6/9 months. For HAI VRE, the same was true in 8/9 months over the same time interval.

Figure 1: Monthly Healthcare-Associated Infection Rate per 1,000 Patient Days



As *Figure 2* shows below, the percentage of patients with confirmed MRSA and VRE infections who experienced an inpatient fall decreased after the suspension of contact precautions. The percentage of patients who developed a new pressure ulcer increased amongst those with confirmed MRSA and decreased amongst those with confirmed VRE.

Figure 2: Healthcare-Associated Infections Adverse Events Rate



Results

Table 1: Cumulative HAI Incidence

	With CP	Without CP	p-value
MRSA Nares	624 cases / 9,980 tests	110 cases / 1,853 tests	0.43
MRSA	8 cases / 108,482 pt days	6 cases / 101,670 pt days	0.71
VRE	18 cases / 108,482 pt days	4 cases / 101,670 pt days	0.04

Table 1 demonstrates that the overall number and rate of HAI MRSA and VRE infections decreased after the suspension of contact precautions. The populations for both infections were compared before and after the suspension of contact precautions using unpaired t-tests with equal variances. There was a statistically significant decrease in HAI VRE infections after suspending contact precautions. There was also a decrease in the MRSA colonization rate from 6.25% to 5.94%, and a greater than 5-fold decrease in the total number of MRSA screens.

Conclusion

This study demonstrated that not only was there not an increase in the rates of HAI MRSA and VRE after the suspension of contact precautions, but there was actually a statistically significant decrease in the rate of VRE infections. The MRSA nares colonization rate also fell in the latter period.

With the sole exception of pressure ulcers in MRSA, the proportion of adverse events also universally fell, keeping in line with the notion that these measures can be burdensome and reduce the amount of time healthcare workers spend with their patients, resulting in less attentive care and poorer conditioning.

These numbers suggest that contact precautions do not play an active role in curbing the spread of MRSA and VRE at LUMC. In fact, they may do more harm than good.

Of course, other factors may have influenced these findings. For example, the Covid pandemic may have led to an overall increase in the use of contact precautions and spurred public health initiatives like social distancing that limited infectious spread.

Nevertheless, the results of this study are quite encouraging. These outcomes suggest that it would be safe to continue to abstain from using contact precautions in patients with MRSA or VRE infections. Further prospective studies should be conducted to validate these findings.

References

1. Siegel, J. D. *et al.* Management of Organisms in Healthcare Settings , 2006. *Infect. Control* (2006).
2. Young, K., Doernberg, S. B., Snedecor, R. F. & Mallin, E. Things we do for no reason: Contact precautions for MRSA and VRE. *J. Hosp. Med.* **14**, (2019).
3. Marra, A. R., Edmond, M. B., Schweizer, M. L., Ryan, G. W. & Diekema, D. J. Discontinuing contact precautions for multidrug-resistant organisms: A systematic literature review and meta-analysis. *Am. J. Infect. Control* **46**, (2018).
4. Karki, S., Leder, K. & Cheng, A. C. Patients under Contact Precautions Have an Increased Risk of Injuries and Medication Errors A Retrospective Cohort Study. *Infect. Control Hosp. Epidemiol.* **34**, (2013).
5. Martin, E. M. *et al.* Noninfectious Hospital Adverse Events Decline after Elimination of Contact Precautions for MRSA and VRE. *Infect. Control Hosp. Epidemiol.* **39**, (2018).
6. CDC. *National Healthcare Safety Network (NHSN) Patient Safety Component Manual. National Healthcare Safety Network (NHSN) Patient Safety Component Manual* (2021).

Prognostic Value of Cardiac Magnetic Resonance Imaging Derived Myocardial Strain Analysis and Late Gadolinium Enhancement in Hypertrophic Cardiomyopathy

Sovik De Sirkar, MD; Matthew Thomas, DO; Susie Kim, MD; Menhel Kinno, MD

Background

- Segmental wall thickness and late gadolinium enhancement (LGE) have been shown to be positively correlated and linked to adverse clinical outcomes in patients with Hypertrophic Cardiomyopathy (HCM)[1].
- The role of cardiac magnetic resonance (CMR)-derived myocardial strain analysis is poorly understood in the HCM population[2,3].
- The primary objective of this study was to evaluate if myocardial strain is associated with LGE and segmental wall thickness, and thus can serve as a corollary prognostic indicator of clinical outcomes in HCM.

Methods

A retrospective analysis of 13 HCM patients at Loyola University Medical Center. CMR images were obtained and analyzed using Circle commercial software (cvi42, Circle Cardiovascular Inc., Calgary, Canada). LGE quantification was determined using a threshold of 6 standard deviations over remote myocardium. Strain was obtained by tissue feature-tracking and involved analysis of left ventricular 3-dimensional imaging for all 16 cardiac segments to assess for peak strain % and time to peak strain. These data were compared to segmental wall thickness and LGE using multivariate linear regression models.

Results

- *Figure* 1 demonstrates that the attenuation of longitudinal strain was related to greater LGE in the basal anteroseptal, mid inferoseptal, inferior, and inferolateral segments.
- *Figure 2* shows the attenuation of circumferential strain also correlated with increased thickness in the apical septal, inferior, and anterior segments and basal antero-lateral segments.
- *Figure 3* demonstrates the direct correlation between the attenuation of radial strain and increased thickness in the apical septal, anterior, and lateral segments.

Results

Figure 1. Longitudinal Strain vs LGE

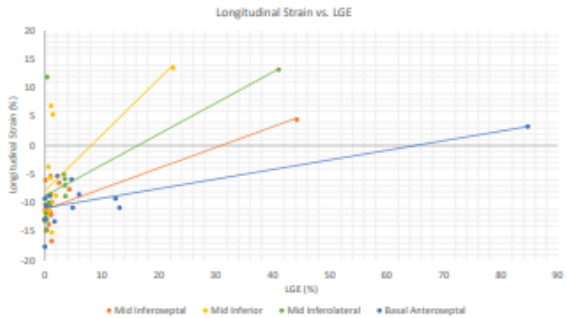


Figure 2. Circumferential Strain vs Wall Thickness

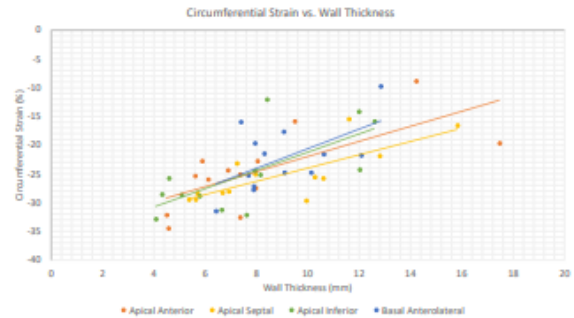
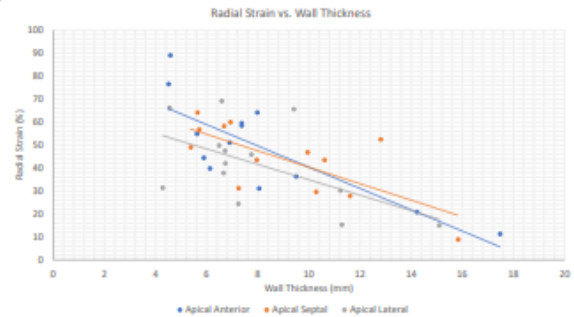


Figure 3. Radial Strain vs Wall Thickness



No relationship exists that represents possible conflicts of interests with respect to the content of this presentation

Results

Table 1. Significantly Correlated Relationships Between Strain, LGE, and Thickness

Association	R²	p-value
Longitudinal strain vs. LGE		
Basal Anteroseptal	0.60	0.00
Mid Inferoseptal	0.62	0.00
Mid Inferior	0.46	0.01
Mid Inferolateral	0.45	0.01
Circumferential strain vs. Thickness		
Basal anterolateral	0.33	0.04
Apical anterior	0.50	0.01
Apical septal	0.61	0.00
Apical inferior	0.48	0.01
Radial strain vs. Thickness		
Apical anterior	0.65	0.00
Apical septal	0.52	0.01
Apical lateral	0.31	0.04
Thickness vs. LGE		
Apical anterior	0.33	0.04

The statistically significant correlations displayed in the above charts are summarized in Table 1 above. Note that thickness also correlated with LGE in the apical anterior segment.

Conclusions

- There was a statistically significant correlation between the degree of attenuated myocardial deformation and the degree of hypertrophy and LGE in multiple segments.
- Strain parameters may be reproducibly correlated with thickness and LGE and, thus, serve as a surrogate clinical prognostic indicator for HCM outcomes.
- Future studies are needed to expand on these findings.

References

1.. Urbano-Moral, JA, Rowin, EJ, Maron, MS, Crean, A, Pandian, NG. Investigation of global and regional myocardial mechanics with 3-dimensional speckle tracking echocardiography and relations to hypertrophy and fibrosis in hypertrophic cardiomyopathy. *Circ Cardiovasc Imaging. 2014;7:11–19. doi: 10.1161/CIRCIMAGING.113.000842*

2. Saito M, Okayama H, Yoshii T, et al. Clinical significance of global two-dimensional strain as a surrogate parameter of myocardial fibrosis and cardiac events in patients with hypertrophic cardiomyopathy. European Heart Journal - Cardiovascular Imaging. 2012;13(7):617-623. doi:10.1093/ejechocard/jer318

3. Delgado V, Marsan NA. Global and Regional Longitudinal Strain Assessment in Hypertrophic Cardiomyopathy. Circulation: Cardiovascular Imaging. 2019;12(8). doi:10.1161/circimaging.119.009586

Standardizing Performance, Interpretation, and the Report Of Pulmonary Function Tests (SPIRO-PFT)

Esther Chen Etchison[1,2], MD; Matthew Honda[1,2], MD; Paul Chung[1,2], DO; Swetha Gogineni[1,2], MD; Ali Saeed[1,2], MD; Jason Peng[1,2], MD; Amal Jubran[2], MD; Suhail Istanbouly[2], MD
[1]Loyola University Medical Center, Maywood, IL
[2]Edward Hines Jr VA Hospital, Hines, IL

Introduction

- Pulmonary function tests (PFT) including spirometry are commonly used to assess and manage lung diseases among veterans seen at the Edward Hines Jr Veterans Affairs Hospital (Hines VA).
- PFT interpretation begins with a review of test quality. Suboptimal PFT's should be interpreted with caution. Once quality has been assured, the next steps involve a series of comparisons relative to reference values and patient's prior PFT's (Figure 1). The final step is to answer the clinical question prompted by the test. Poor choices made during these preparatory steps increase the risk of misclassification.
- The current PFT reporting system at the Hines VA are based on the 2005 American Thoracic Society (ATS) and European Respiratory Society (ERS) International Joint Task Force: Standardisation of Lung Function Testing[1-5]. Since these publications, revisions reflecting the advancement of technological capabilities, new evidence, and new considerations[6, 7] have been made in 2017[8-10] and 2019[11].
- Medical staff at the Hines VA have been trained in performing and interpreting PFTs at different time periods resulting in variability in its reporting and interpretation.

Objectives

- Standardize PFT reference values according to global lung initiative (completed).
- Decrease inter-operator variability in both interpreting PFT results and performing PFT's (in process).
- Update the reporting system/software of PFTs at Hines VA (to be completed).
- Create a simplified report that would provide information to both pulmonary and non-pulmonary healthcare staff to make a diagnosis and to monitor, risk-stratify, and make management decisions for patients (to be completed).

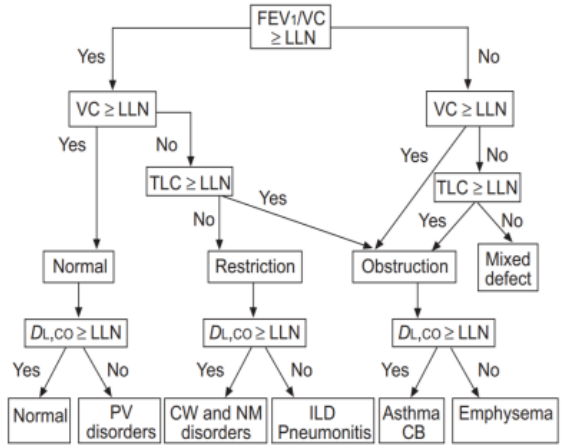


Figure 1. A simplified algorithm to assist with PFT interpretation in the clinical setting from ATS[1-5]. The algorithm presents classic PFT patterns for various pulmonary disorders. The decision about how far to follow the diagram are clinical and vary depending on the question being answered and the patient (who may not present with classic patterns).

	1	2	3	4	5	6
Spirometry						
FEV1 is	normal	normal	moderately reduced	moderately reduced	moderately reduced	severely reduced
FEV1/FVC is	normal	normal	normal	normal	below LLN	normal
Flow-Volume Loop						
Flow-Volume Loop	suggests a normal pattern	suggests a normal pattern	suggests a restrictive pattern	demonstrates a restrictive pattern	suggests a restrictive pattern	demonstrates a restrictive pattern
It also suggests:						
a restrictive component						
an obstructive component						
a poor spirometric maneuver						
inconsistent inspiratory effort						
variable extra-thoracic obstruction		x	x			
variable intra-thoracic obstruction						
increased elastic recoil						
a fixed central airway or laryngeal obstructive process					x	
Response to BD						
There is	no response	borderline response	no response		borderline response	
Lung Volumes						
Lung Volumes as estimated by	inert gas method	inert gas method	inert gas method	plethysmography (body box)	inert gas method	inert gas method
are	consistent with gas trapping	consistent with gas trapping	consistent with gas trapping	reduced consistent with restrictive defect	consistent with gas trapping	consistent with isolated reducing in VC
Gas Diffusion						
The DLCO	corrected for hemoglobin	corrected for hemoglobin	corrected for hemoglobin	corrected for hemoglobin	corrected for hemoglobin	corrected for hemoglobin
is	mildly reduced	severely reduced	severely reduced	normal	moderately reduced	mildly reduced

Table 1. Interpretation and reporting of PFT's by pulmonary fellows and medical residents prior to review session. This table is a representation of the actual template used at Hines VA for PFT review. Each column represents a patient. Interpretations are made on spirometry, lung volumes, diffusion capacity for carbon monoxide, oxygen saturation on room air and exercise (now shown), and arterial blood gases (now shown) followed by a final report with overall impressions (not shown). (BD = bronchodilator)

Methods

Decrease Variability in Interpretation of PFTs

PFTs prior to 2019 will be read independently by pulmonary fellows and medical residents (Table 1). These will then be compared to historical interpretations to assess for inter-operator variability. A review session led by the medical director of the pulmonary function laboratory (SI) will be held regarding the assessment, reporting, and interpretation of PFTs. PFTs from 2021 to the present will then be read by the same group of pulmonary fellows and medical residents to compare and assess for inter-operator variability.

Quality Assurance of Technical Aspects of PFTs

Staff technician involved with patient performance of PFTs will be provided education at recurrent intervals to ensure the quality of the reported PFT values. These education sessions will also include review of PFT performance to ensure quality in the technical aspects of PFTs and to ensure that the software, if applicable, is in good working condition.

Updates to the PFT Report Format

The current template used for reporting and interpreting PFTs will be reviewed by this group which will include the medical director of the pulmonary function laboratory (SI) and the division chief of pulmonary and critical care medicine (AJ). Revisions will include but is not limited to updates in terminology, updates in testing parameters, addition of grading systems and differential diagnoses.

References

1. Miller MR, Crapo R, Hankinson J et al. General considerations for lung function testing. *Eur Respir J*. 2005;26(1):153-161.
2. Miller MR, Hankinson J, Brusasco V et al. Standardisation of spirometry. *Eur Respir J*. 2005;26(2):319-338.
3. Wanger J, Clausen JL, Coates A et al. Standardisation of the measurement of lung volumes. *Eur Respir J*. 2005;26(3):511-522.
4. Macintyre N, Crapo RO, Viegi G et al. Standardisation of the single-breath determination of carbon monoxide uptake in the lung. *Eur Respir J*. 2005;26(4):720-735.
5. Pellegrino R, Viegi G, Brusasco V et al. Interpretative strategies for lung function tests. *Eur Respir J*. 2005;26(5):948-968.
6. Iyer VN, Schroeder DR, Parker KO, Hyatt RE, Scanlon PD. The nonspecific pulmonary function test: longitudinal follow-up and outcomes. *Chest*. 2011;139(4):878-886.
7. Hyatt RE, Cowl CT, Bjoraker JA, Scanlon PD. Conditions associated with an abnormal nonspecific pattern of pulmonary function tests. *Chest*. 2009;135(2):419-424.
8. Culver BH, Graham BL, Coates AL et al. Recommendations for a Standardized Pulmonary Function Report. An Official American Thoracic Society Technical Statement. *Am J Respir Crit Care Med*. 2017;196(11):1463-1472.
9. Graham BL, Brusasco V, Burgos F et al. 2017 ERS/ATS standards for single-breath carbon monoxide uptake in the lung. *Eur Respir J*. 2017;49(1):10.1183/13993003.00016-2016. Print 2017 Jan.
10. "2017 ERS/ATS standards for single-breath carbon monoxide uptake in the lung." Brian L. Graham, Vito Brusasco, Felip Burgos, Brendan G. Cooper, Robert Jensen, Adrian Kendrick, Neil R. MacIntyre, Bruce R. Thompson and Jack Wanger. Eur Respir J 2017; 49: 1600016. *Eur Respir J*. 2018;52(5):10.1183/13993003.50016-2016. Print 2018 Nov.
11. Graham BL, Steenbruggen I, Miller MR et al. Standardization of Spirometry 2019 Update. An Official American Thoracic Society and European Respiratory Society Technical Statement. *Am J Respir Crit Care Med*. 2019;200(8):e70-e88.

External Validation of Loyola University Medical Center's Cardiac Evaluation Prior to Renal Transplantation Protocol

Ivo Genev[1], Sanjeev Akkina[1], John J. Lopez[1], Subir Shah[1], Amishi Desai[1], Jongwon Yoo[1], Raquel Garcia-Roca[1], Verghese Mathew[2]
[1]Loyola University Chicago Stritch School of Medicine, Maywood, IL, USA
[2]Worldwide Network of Innovation In Clinical Education and Research (WNICER) Institute

Introduction

A variety of approaches are undertaken for cardiovascular screening prior to approval for kidney transplantation. We sought to evaluate the effect of a revised pre-transplant cardiac assessment protocol at our institution, which included more frequent use of coronary angiography in patients felt at increased cardiac risk.

Methods

Examined all patients (n=419) who underwent kidney transplantation three years before (2013-2015, n=184) and after (2016-2018, n=235) initiation of a new cardiac evaluation protocol at Loyola Medical Center. Subsequently, as a validation cohort, identified patients via the United States Renal Data System (USRDS) (n=25,276) who had undergone a renal transplant between 01/2010 and 01/2015. Explored the area under receiver operating characteristic curve when the Loyola screening protocol is applied to the larger national sample. Primary endpoint was a combined rate cardiovascular mortality, non-fatal myocardial infarction, need for emergent revascularization, and hospitalization for unstable angina.

Screening Protocol

- Diabetes Mellitus
- Peripheral Arterial Disease
- Male age > 45
- Females age > 55

→ No risk factors = **Low**
→ 1 factor = **Intermediate**
→ 2+ risk factors = **High**

- History of MI
- Need for Revascularization
- LVEF < or = 40%

→ 1+ factor = **Very High**

Pre-Operative Screening:

- Low Risk: No screening required
- Intermediate: Yearly non-invasive testing
- High or Very High Risk: Angiography

Results

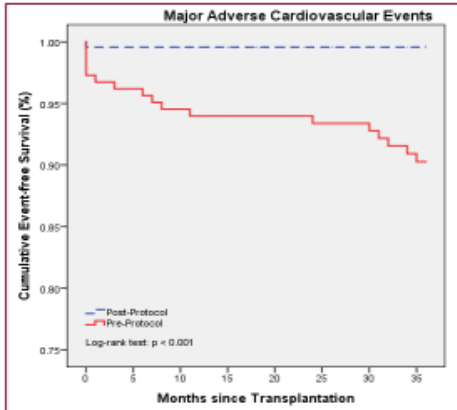


Figure 1: Kaplan-Meyer survival curve of composite cardiovascular events before and after the new Loyola protocol was implemented

Major Adverse Cardiovascular Events:

- At 12 months: 11 (6.0%) of the pre- and 1 (0.4%) of the post-protocol groups – adjusted HR 0.08 (95% CI: 0.01-0.620, p=0.016)
- At 36 months: 17 (9.2%) and 1 (0.4%) patients, before and after the revision resulting in an adjusted HR 0.06 (95% CI: 0.01-0.45, p = 0.006)
  - Number needed to treat (NNT) – 11
- Non-fatal Type II NSTEMI:
  - 32 (17.4%) in the pre- and 26 (11.1%) post- groups, (p=0.06)

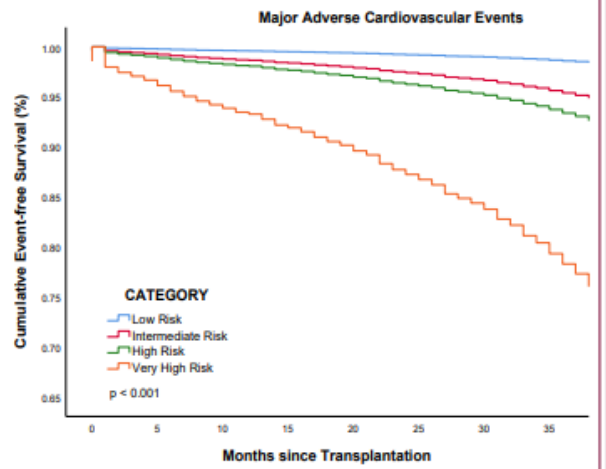


Figure 2: Kaplan-Meyer survival curve of major adverse cardiovascular events utilizing the USRDS database cohort.

- Low Risk (n=6046):
  - 21 (0.3%) events, OR 0.12 (95% CI: 0.08-0.19)
- Intermediate Risk (n=8875):
  - 98 (1.1%) events, OR 0.39 (95% CI: 0.31-0.49)
- High or Very High Risk (n=10,355):
  - 436 (4.2%) events, OR 5.47 (95% CI: 4.46-6.71)

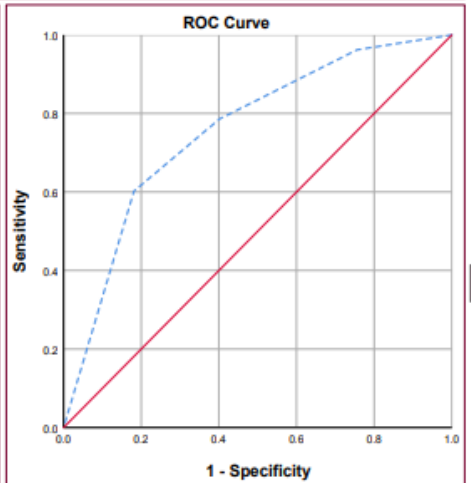


Figure 3: Receiver operating characteristic curve of the new protocol utilizing the USRDS database cohort.

- AUC 0.76 (95% CI: 0.74-0.78, p<0.001)
- Sensitivity: 0.79 (95% CI: 0.75-0.82)
- Specificity: 0.60 (95% CI: 0.59-0.60)
- Positive LR: 1.96 (95% CI: 1.87-2.05)
- NPV: 0.99 (95% CI: 0.991-0.993)

Discussion

- Death due to cardiovascular disease is the leading cause of functioning graft loss accounting for approximately half of all cases [1].
- The new approach at Loyola resulted in increased rates of angiography in patients deemed high or very high risk (64.1% pre- vs 95.7% post-, p<0.001), without a significant change in those considered intermediate or low risk (18.3% pre- vs 12.8% post-, p=0.210).
- For comparison, the Revised Cardiac Risk Index (RCRI), a commonly used preoperative cardiovascular risk stratification tool, has a moderate discrimination ability between patients at low versus high risk for cardiac events after noncardiac surgery with [2]:
  - AUC 0.75 [95% CI, 0.72 to 0.79]
  - Sensitivity, 0.65 [CI, 0.46 to 0.81]
  - Specificity, 0.76 [CI, 0.58 to 0.88]
  - Positive LR, 2.78 [CI, 1.74 to 4.45]

Conclusion

In patients undergoing evaluation for kidney transplant, our revision of the cardiac screening protocol resulted in a higher rate of coronary angiography, however it was associated with a reduction in major cardiovascular events and overall mortality after transplant with a similar predictive ability to other commonly utilized pre-operative assessment tools such as the RCRI.

References

1. Ojo AO, Hanson JA, Wolfe RA, Leichtman AB, Agodoa LY, Port FK. Long-term survival in renal transplant recipients with graft function. Kidney Int 2000;57:307–313
2. Ford MK, Beattie WS, Wijeysundera DN. Systematic review: prediction of perioperative cardiac complications and mortality by the revised cardiac risk index. Ann Intern Med. 2010 Jan 5;152(1):26-35. doi: 10.7326/0003-4819-152-1-201001050-00007. PMID: 20048269.

Disclosures: None of the authors have any disclosures to report.

Phenobarbital for alcohol withdrawal in the ICU setting

Yiran Gong MD, Ejaaz Kalimullah MD
Loyola University Medical Center

Introduction

- LUMC utilizes CIWA-Ar for assessment of alcohol withdrawal
- Ten items each evaluated independently which together yield a score which correlates with the severity of alcohol withdrawal
- Current CIWA-Ar protocol at LUMC utilizes scaling doses of lorazepam correlating with severity of symptoms
- Lorazepam has the advantage of short half-life which is associated with less risk of oversedation

Why phenobarbital?

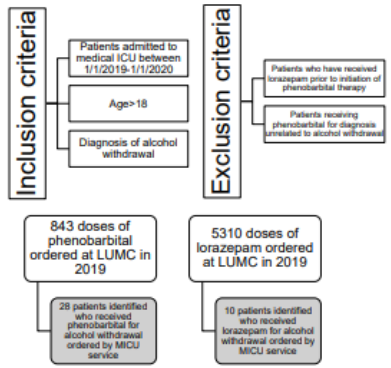
- Previous studies showing benefits of phenobarbital as adjunctive and monotherapy in ICU settings
- Phenobarbital, whether in combination with lorazepam or as monotherapy, has shown to decrease ICU-LOS, time on mechanical ventilation, and readmission to an ICU for severe alcohol withdrawal
- Currently LUMC does not have a protocol in place for phenobarbital either as mono or adjuvant therapy for alcohol withdrawal

Objectives

- Determine using data gathering and analysis if phenobarbital-based approaches to alcohol withdrawal at LUMC has resulted in improvements in ICU LOS and decreased probability of ventilation over lorazepam-based approaches
- Data can be further expanded to include readmissions to the ICU for patients who transition to a floor setting while undergoing phenobarbital therapy for alcohol withdrawal

Methods

- Single center retrospective study
- Data provided by LUMC pharmacy



Results

Group	Gender	ICU-LOS	Age
lorazepam	F	3.666667	41.333333
	M	4.857143	51.142857
phenobarbital	F	11.250000	51.250000
	M	5.541667	48.083333

Table 1. Mean LOS and age separated by gender and treatment group

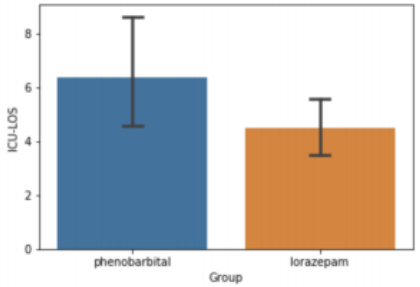


Figure 1. Mean and standard deviation of ICU LOS (in days) for phenobarbital and lorazepam

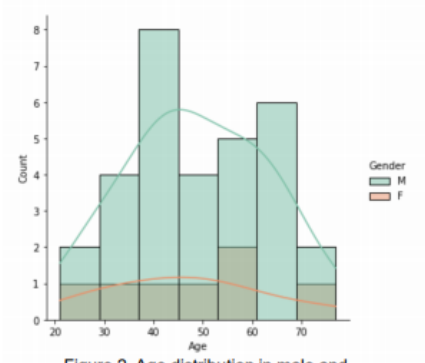


Figure 2. Age distribution in male and female groups

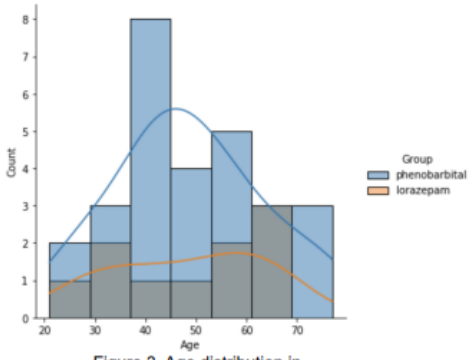


Figure 3. Age distribution in phenobarbital and lorazepam groups

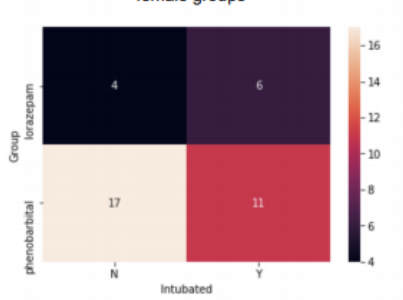


Figure 5. Contingency table for Chi-Square Test

Figure 6. QR code for statistical analysis methods

Conclusion

- No significant differences in ICU-LOS were found between phenobarbital and lorazepam monotherapy
- No significant differences were found in age between the two treatment groups
- There were more females than males in the phenobarbital group compared to the lorazepam group, however there was not a significant gender difference in ICU-LOS in either treatment group
- No significant differences were observed in frequency of intubations between the phenobarbital and lorazepam groups
- Phenobarbital seems to be the preferred way to treat alcohol withdrawal in the ICU despite the lack of a formalized order set

Limitations

- Many admissions to an ICU setting for alcohol withdrawal had additional active problems, confounding the LOS and intubation status
- Analysis not adjusted for severity of alcohol withdrawal, possible bias into determination of receiving phenobarbital vs. lorazepam
- Small sample size due to only pulling from one year of prescriber data, limited in geography to only medical ICU services

Future considerations

- Analyzing data for the years of 2018-2021
- Analysis of other intensive care unit services, such as SICU and Neuro ICU
- Stratification of data based on severity of alcohol withdrawal
- Prospective data gathering using phenobarbital
  - Patients meeting inclusion criteria will receive phenobarbital according to a preset protocol until symptom control is achieved
  - Included study population stratified by alcohol withdrawal as primary diagnosis vs. secondary diagnosis
  - Data for patients receiving phenobarbital in an ICU setting will be collected in a 12-month time window and compared to historical data for ICU patients on lorazepam for alcohol withdrawal from the prior year
  - Collected data will focus on ICU LOS, number of patients requiring mechanical ventilation, and readmission to an ICU setting for alcohol withdrawal

References

Tidwell, William P, et al. "Treatment of Alcohol Withdrawal Syndrome: Phenobarbital vs CIWA-Ar Protocol." American Journal of Critical Care : an Official Publication, American Association of Critical-Care Nurses, U.S. National Library of Medicine, Nov. 2018, www.ncbi.nlm.nih.gov/pubmed/30385536?dopt=Abstract.

Hammond, Drayton A, et al. "Patient Outcomes Associated With Phenobarbital Use With or Without Benzodiazepines for Alcohol Withdrawal Syndrome: A Systematic Review." Hospital Pharmacy, SAGE Publications, Oct. 2017, www.ncbi.nlm.nih.gov/pmc/articles/PMC5735736/.

Nisavic, Mladen, et al. "Use of Phenobarbital in Alcohol Withdrawal Management - A Retrospective Comparison Study of Phenobarbital and Benzodiazepines for Acute Alcohol Withdrawal Management in General Medical Patients." Psychosomatics, U.S. National Library of Medicine, 2019, www.ncbi.nlm.nih.gov/pubmed/30876654.

Rosenson, Jonathan, et al. "Phenobarbital for Acute Alcohol Withdrawal: a Prospective Randomized Double-Blind Placebo-Controlled Study." The Journal of Emergency Medicine, U.S. National Library of Medicine, Mar. 2013, www.ncbi.nlm.nih.gov/pubmed/22999778?dopt=Abstract

Saitz, R, et al. "Individualized Treatment for Alcohol Withdrawal. A Randomized Double-Blind Controlled Trial." JAMA, U.S. National Library of Medicine, 17 Aug. 1994, www.ncbi.nlm.nih.gov/pubmed/8046805.

3MICU Restraint Reduction

Matthew Honda MD, Esther Chen Etchison MD, Tianyi Swartz MD, Nicholas Brement MD, Ann Edlbauer RN, Emily Gilbert MD
Loyola University Medical Center

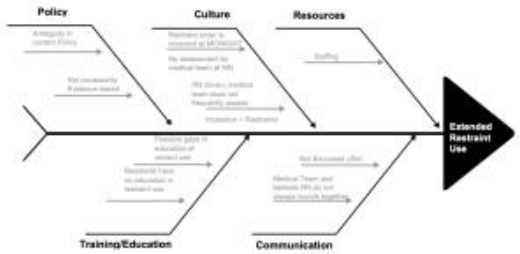
1. Background and Fishbone

• The current criteria for restraint use are "used only when clinically justified or when warranted by patient behavior that threatens the physical safety of the patient, staff, or others" - Loyola University Medical Center's restraint policy (6).

• However, restraints are not shown to prevent adverse events such as falls or self-harm and paradoxically, they are associated with increased unplanned extubations, loss of lines/devices, worsening delirium and longer hospitalizations (1, 3, 9).

•Currently there is no formalized process to reduce restraint use. Bedside decisions about restraint use are primarily made by RNs.

• Unplanned extubations are submitted as VOICE reports



2. AIMS Statement

To reduce the use of physical restraints in the Medical Intensive Care Unit at Loyola University Medical Center, and demonstrate that restraint reduction is not associated with compromises in patient safety

3. Intervention and Results

Intervention: MICU team asks on daily rounds
"Can we de-escalate restraints today?"

Fliers were distributed and QI team members discussed with RNs and Medical Teams. Asked Interns to document if patient was in restraints as part of daily progress notes

	Pre-Intervention	Post Intervention
Date of Collection	9/2019 - 8/2020	1/2021 - 3/2021
Number of Patients in Restraints	363	103
Average # of Days in Restraints	6	2
Median # of Days in Restraints	5	3
Unplanned Extubations (VOICE Reports)	8	0

VOICE reporting documentation revealed that 7/8 patients were in restraints during unplanned extubations

4. Discussion

Asking the nurse "can we de-escalate restraints today" led to a decrease in the number of of patients in restraints without an increase in the number of unplanned extubations

Limitations:

•Resident teams change every 2 weeks making disseminating information/education difficult

•MICU teams not always assessing with bedside RN

•We found that the restraint order expires at midnight which falls on the overnight cross covering intern to renew; who is not as familiar with the patients. The current culture is for the intern to renew all restraints in the unit overnight.

Next Steps:

•Resident teams change every 2 weeks but RNs are constant. Ask RN to be present for bedside rounds to help address restraints similar to how foleys and lines such as CVC are assessed on a daily basis.

•RNs to ask for renewal of restraints at noon instead of at midnight. Therefore the medical team who know the patients best can reassess, collaborate with the bedside RN, and reorder restraints if needed

References

Acknowledgements

Special Thanks to Katie Cram, 3MICU Staff , Dr. Patel

Improving Patient Safety During Intra-Hospital Transport of ICU Patients

Arushi Hukku MD, Martin Kamper MD, Brian White MD, Kevin Simpson MD | Loyola University Medical Center

LOYOLA HEALTH SCIENCES DIVISION

1 Background

Intra-hospital transport of critically ill patients is associated with potentially severe adverse events. Because physicians do not usually accompany their patients during transport, they may not often be aware of the technical or medical issues that arise during this process.

Previous studies have identified common complications of transport and have developed intra-hospital transport guidelines in response. The purpose of this study is to investigate current intra-hospital transport of medical ICU patients at Loyola University Medical Center, and utilize this data to develop a "Transport Tool."

The "Transport Tool" will include an algorithm to risk stratify critically ill patients for possible near misses or adverse events during or shortly after intra-facility transport, as well as a checklist for nursing staff to abide by during transport.

Our goal is to reduce transport-related near miss or adverse events with implementation of this tool, by structuring the transport process and optimizing communication regarding intra-hospital transport of these patients.

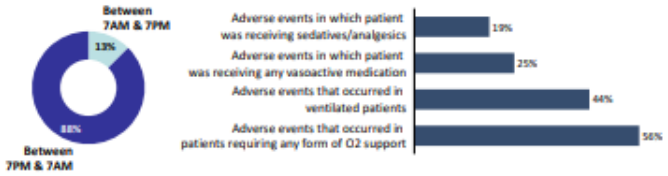
2 Baseline Data

Data from 52 Transport Encounters collected

Transport encounters in which adverse events were reported: ***16/52, or 30.7%***

Pain, Agitation, Increased pressor, Monitor battery died, No RT, No extra O2 tank, Equipment fall, Delay at imaging site, Lines/tubes tangled, Pt not fitting in scanner, Increased suctioning needs, Increase vent support/desaturations

Transport Related Event Risk Factors (n=16)



Communication Related Events (n=52)

5/52 — *Transport encounters in which nursing staff reported "no" to having adequate support* → 100% *Reported adverse events*

32/52 — *Transport encounters in which MD did NOT provide formal risk assessment* → 62.5% *Reported adverse events*

Survey Data (n=67: physicians)

Survey Data (n=31: nurses)

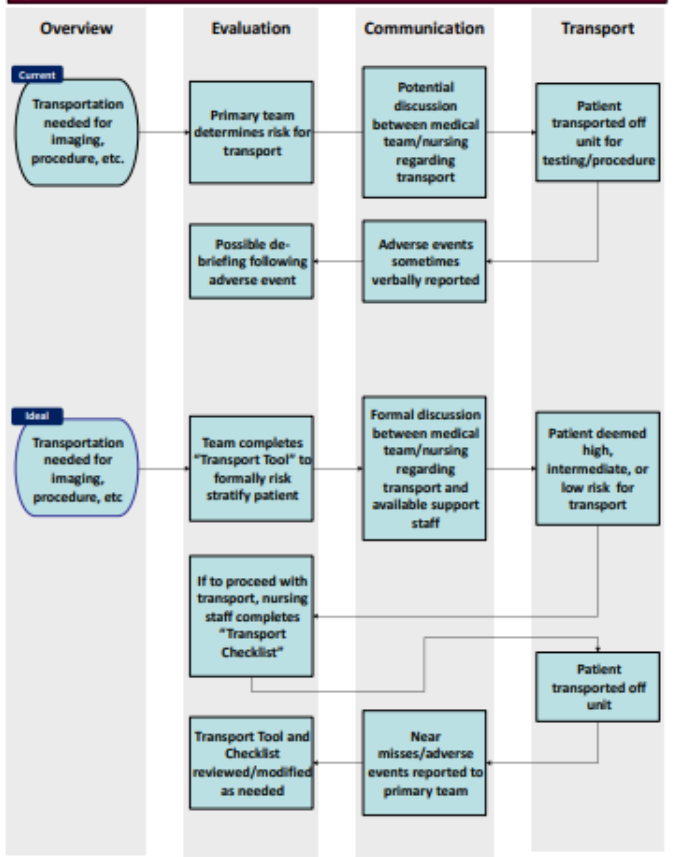
3 Proposed AIM Statement

NOW → **FUTURE**

30.7% of transport encounters have reported near misses/adverse events

Our goal is to ultimately **reduce transport related near misses/adverse events** by 10% by December 2021

4 Current and Ideal State Process Map



5 Analysis and Discussion

Communication/Support:
- Risk assessment per MD staff possibly suboptimal and may increase likelihood of reported near misses/adverse events
- Communication between medical and nursing staff may be a contributing factor to transport related events
- Survey data reports a lack of communication regarding adverse events and lack of confidence or comfort in transporting patients as well as assessing patient risk

Timing of Transport:
- Overnight transport may be associated with increased risk of near misses/adverse events, possibly due to fewer support medical staff

O2 requirements:
- Risk of near misses/adverse events may be increased in ventilated patients or any patients with extra medical equipment such as O2 tanks

Hemodynamics, Sedation, and Agitation:
- Patients on vasoactive medications and/or sedation were higher risk for experiencing a near miss or adverse event
- Patients who were hypotensive before transport (systolic BP <90) were higher risk for experiencing an adverse event, particularly in requiring pressor increase

Limitations:
- Small sample size
- Staff may have retroactively submitted transport data for patients with adverse transport related events
- Perception of lack of support staff may drive higher rates of reported adverse events
- Very high risk groups not included, likely because they were not sent for transport

6 Future Steps

Based on this preliminary data, we plan to develop a three-part tool available for medical and nursing staff to address the issue of intra-hospital transport of critically ill patients:

Part 1: Risk stratification tool
- Identify high-risk patients in whom the risk of transport may outweigh any theoretical benefits of diagnostic testing/procedures and may benefit from delay or cancellation of transport
- Help guide physician decision making regarding the transport of critically ill patients via an objective assessment of risk based on data collected from previous transport encounters and input from nursing staff

Part 2: Transport encounter checklist
- If decision made to transport using risk stratification tool above, proceed to use checklist of housekeeping items to address and correct possible sources of common adverse events (check equipment, medication bags, hooking up oxygen, report events and debriefing, etc) prior to transport

Part 3: Data collection and analysis
- To take place with parts 1 and 2, will track frequency and type of adverse events to determine impact
- A component of the checklist will be dedicated to recording adverse events and documenting the nature of the event, similar to the initial data collection phase

Socioeconomics of Coronary Artery Calcium: *Is it Scored or Ignored?*

Mashaal Ikram MD[1], Kim Allan Williams Sr. MD[2]

1. Loyola University Medical Center, Maywood, IL
2. Rush University Medical Center, Chicago, IL

LOYOLA MEDICINE

RUSH UNIVERSITY MEDICAL CENTER

Background

Chicago is one of the most racially segregated cities in the US, with up to a 30-year mortality gap between some neighborhoods.

Computed tomographic coronary artery calcium scoring (CACS) is an excellent risk stratification tool, but costs about $200 out-of-pocket, making it inaccessible to some.

Objective

To determine whether ACC/AHA guideline-recommended screening tool is accessible to all populations and neighborhoods, we evaluated the price and availability of CACS in Chicago area hospitals.

Methods

ILLINOIS HOSPITALS
N= 40

- CACS N= 30
- No CACS N= 10

Hospital service area (by zip code):

1) Compared demographic, socioeconomic, and ethnic population data using US census bureau;
2) Compared pricing of CACS between hospitals; and
3) Analysis of data using un-paired t-testing for comparison of means.

Results

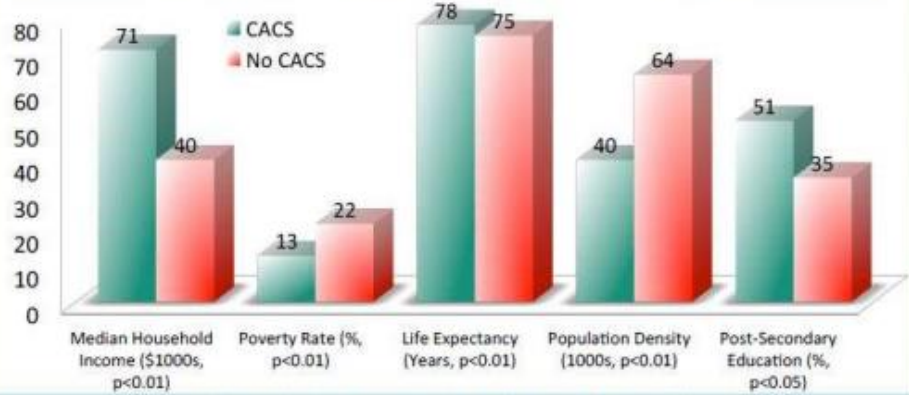


FIGURE 1: NEIGHBORHOODS WITH AND WITHOUT CACS

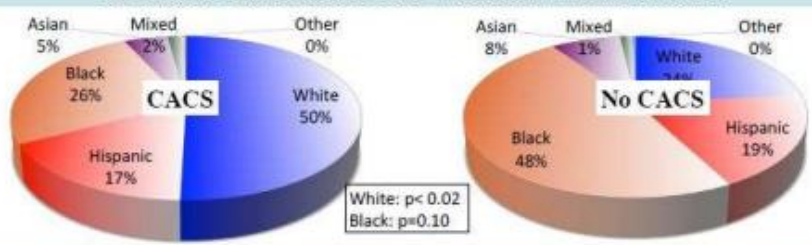


FIGURE 2: ETHNIC POPULATION OF NEIGHBORHOODS WITH AND WITHOUT CACS

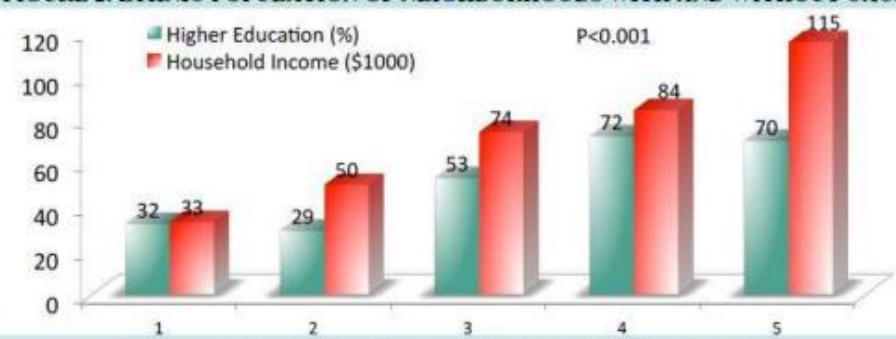


FIGURE 3: HOSPITALS WITH CACS BY QUINTILES OF INCOME

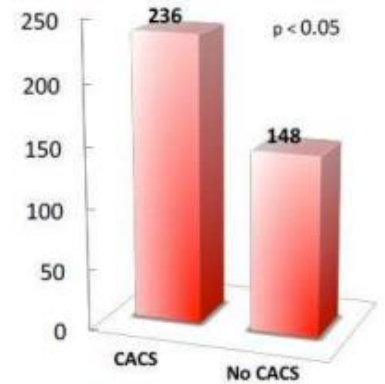


FIGURE 4: AVERAGE HOSPITAL BED CAPACITY

Conclusion

Screening for cardiovascular disease should be accessible to and affordable for everyone, along with other risk reduction initiatives such as community blood pressure surveillance, nutrition interventions, diabetes detection, CPR and improving health literacy.

We Propose:

1) a national policy change to include CACS as a first-dollar covered preventive service, as it currently is in the state of Texas, and
2) that hospital systems advertise and routinely perform this inexpensive test for no cost in socioeconomically depressed areas, as a means to enhance risk factor and disease modification and management.

Marketing Cardiovascular Mortality?
Healthy vs. Unhealthy Food in Television Advertising

Mashaal Ikram MD[1], Khari Hill [2] Kim Allan Williams Sr. MD[2]
1. Loyola University Medical Center, Maywood, IL 2. Rush University Medical Center, Chicago, IL

RUSH UNIVERSITY MEDICAL CENTER

LOYOLA MEDICINE

Background

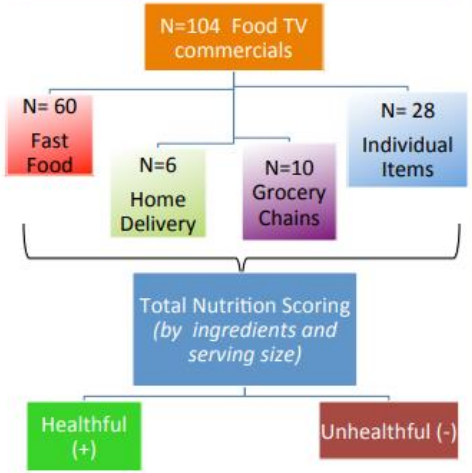
Cardiovascular disease has been the leading killer of Americans since the Spanish flu pandemic of 1918.

During the SARS-CoV-2 pandemic, social distancing and stay-at-home mandates have increased television (TV) engagement and media marketing has become more impactful.

Objective

We evaluated the healthfulness of food marketing, based on commercials most frequently aired on American primetime networks during SARS-CoV-2 pandemic.

Methods



- Data analyzed using comparison of means with un-paired t-test

Results

TABLE 1: SCORING OF FOOD ITEMS ON TELEVISION COMMERCIALS

Type of Commercial	Example	Contents	Score
Fast Food	Chicken wings, beef burger, soft drink	Sugar sweetened beverage, fried potatoes, vegetables, animal fat, dairy, chicken, beef, ranch dressing	Healthful (1)+ Unhealthful (-7): Total= -6
Home Delivery	Fully cooked vegan pizza with whole grain rice and vegetable sides	Vegetables, whole grains, sauce (sodium 700mg)	Healthful (2)+ Unhealthful (-1): Total= 1
Grocery Chains	Produce items: cheese, fruits, vegetables, milk and eggs	Vegetables (x2), fruits (x2), dairy, eggs	Healthful (4)+ Unhealthful (-2): Total= 2
Individual Items	yogurt	dairy	Healthful (0)+ Unhealthful (-1): Total= -1

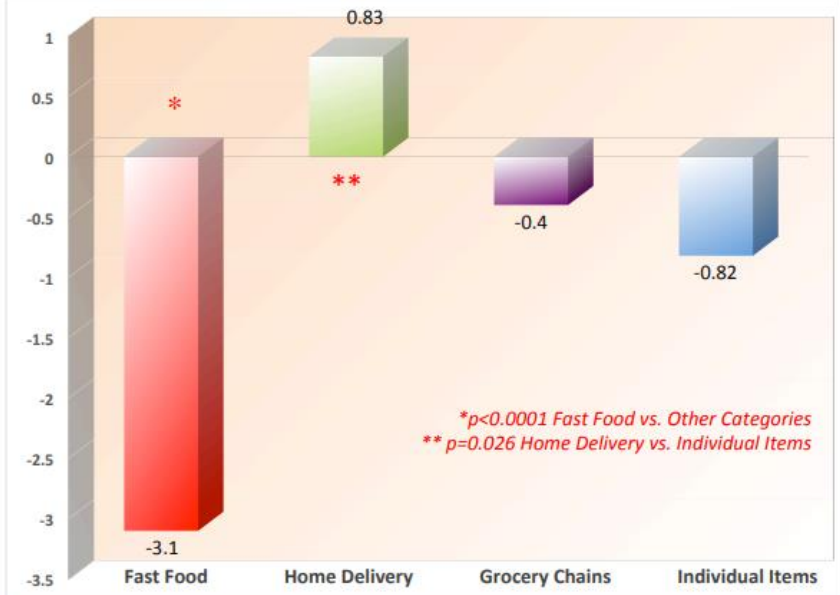


FIGURE 1: DISTRIBUTION OF MEAN HEALTH DIET INDEX IN TELEVISION COMMERCIALS

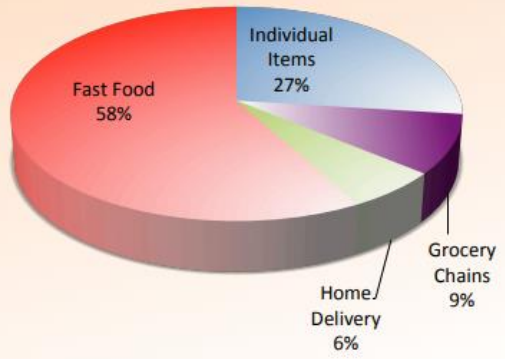


FIGURE 2: FREQUENCY OF FOOD MARKETING CATEGORIES

Conclusion

- **Clinical Perspective**: Commercial TV in the US routinely promotes the consumption of foods that are documented in the published medical literature and nutritional guidelines to be unhealthy, particularly those underpinning cardiovascular disease and risk factors.
- We suggest regulation and implementation of legislation, similar to the advertising ban on cigarettes, in order to reduce the frequency and/or alter the content of these food commercials, and consider a ban on such advertising to children, similar to those employed in Canada and the European Union.

*All authors have nothing to disclose.

Improving Utilization and Awareness of Targeted Temperature Management (TTM) for Patients Achieving Return of Spontaneous Circulation after Cardiac Arrest (ROSC) at Hines VA Hospital

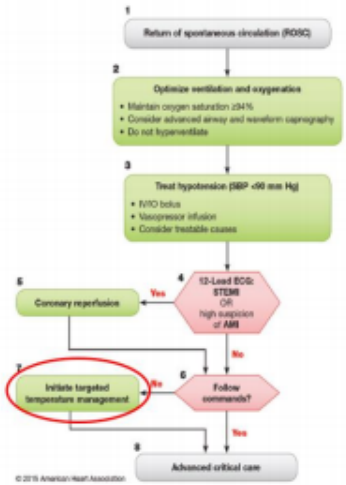
Daniel Kim, MD PGY3, Punit Arora, MD PGY2, Rishi Mehta, MD
Loyola University Medical Center Department of Internal Medicine, Hines, Jr. VA Hospital

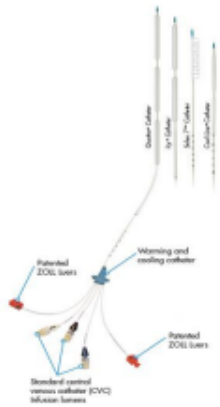
Background

- Over the last several decades, TTM to induce mild hypothermia has been the standard for patient who remain comatose after surviving a cardiac arrest
- Studies have shown that TTM provides improved neurological in these patients
- A recent RCT comparing 33C with 36 C for OHCA patients showed that both targets had similar mortality and neurological outcomes at 180 days.

- The current AHA guidelines recommend as part of their ACLS algorithm that patients who achieve ROSC but not following commands after optimization of respiratory function/hypotension be initiated on targeted temperature management.

- Various institutions have differing protocols for qualifications for TTM as well as methods for carrying it out.
  - See current Hines Protocol Outline Below





- HVA Protocol:Orders -> Emergency Department Menu -> Hypothermia Protocol
- Inclusion Criteria
  - Age > or = 18
  - Hx of Cardiac Arrest post VF or pulseless VT
  - Return of ROSC within 50 minutes of initiating code
  - Patient is within 6-hour window of ROSC
  - Unconscious/Comatose
    - Does not follow commands, no speech, no eye opening and no purposeful movements even to noxious stimuli
  - Able to maintain a SBP >90mm HG or MAP >60mm Hg with or without fluids/vasopressors
  - Intubated
- Exclusion Criteria
  - Age <18
  - Pregnancy
  - Pre-existing DNR
  - Primary Coagulopathy or uncontrollable bleeding
  - Sepsis as possible cause of cardiac arrest
  - Other possible causes for coma (eg: drug overdose, intoxication, head trauma, stroke, hypoglycemia)
  - Shock resistant to fluids/vasopressors (MAP <60 mm Hg, SBP <90mm Hg)
  - Significant pre-existing severe neurologic impairment
  - ROSC >50 minutes of initiating code
  - Past 6 hours window of ROSC

Objective

- Analyze frequency of use of TTM at Hines VA Hospital from 2017-2020

- Increase consideration and knowledge of appropriate utilization of TTM in post cardiac arrest patients achieving ROSC

- Assess pre and post intervention level of knowledge and familiarity of housestaff on applying hypothermia protocol at Hines VA Hospital

2017-2020 CODE BLUE DATA

	2017-2018	2019	2020
Total Code Blue n	49	48	26
ROSC n(%)	29(59)	28 (58)	9(35)
24h Survival n(%)	23(47)	16 (33)	4(15)
Survival to Discharge n(%)	16(33)	4 (8)	1(4)
Initial Rhythm (ROSC Patients)			
PEA/Asystole	25	24	9
VT/VF	4	4	0
Time to ROSC (minutes)			
0-10	19	13	4
11-20	8	6	3
21-30	0	5	1
>30	2	4	1
Post ROSC Neuro Exam Documentation			
Yes	23	18	2
No	6	9	7
TTM Considered? (Per Documentation)			
Yes	2	5	1
No	27	23	8
TTM Started			
Yes	0	4	1
No	29	1	0

	2017-2018	2019	2020
TTM Recipients n	0	4	1
Initial Rhythm	N/A		
PEA/Asystole		4	1
VT/Vf		0	0
Time to Target Temperature (hours)	N/A		
0-6		3	1
7-12		0	0
13-24		0	0
>24		1	0
Mean Times above Target Temp (n)	N/A	4	3
Post TTM Neuro Exam Documentation	N/A	4	1
Survival	N/A		
24h survival		4	0
Survival to Discharge		2	0

Proposed Interventions

- Development of Hines VA Hospital Specific TTM Handbook for housestaff
  - Establish clear guidelines on who initiates and who maintains in what setting and location of patient
  - Publish handbook on Internal Medicine Residency Website
  - Provide laminated protocol cards for all ICUs as well as ED

- Implement an easily accessible hypothermia protocol order set within the EMR (CPRS)
  - Order Set to include labs, meds, diagnostic testing necessary for monitoring while on targeted temperature management
  - Include relevant pager numbers for trouble-shooting (e.g: Neurology/Cardiology/MICU)

- Pre/Post Intervention for Housestaff prior to starting Hines CMICU to assess overall knowledge on how to initiate TTM at Hines

- Include section in CODE BLUE note template asking if TTM considered after ROSC achieved.

Next Steps

- Finalize draft of Handbook and laminated TTM outline cards for ICU
  - Upload onto residency website

- Work with IT to add TTM order set and protocol to main order menu for under MEDICINE INP Add New Orders

- Send out Pre Intervention Survey to all housestaff working in ICU/ED
  - Will also use this to assess barriers faced by housetaff in considering TTM or initiating it

- Develop new CODE BLUE note template to include section regarding TTM

- Reassess with post intervention survey in 3 nonths

- Review chart data on TTM usage for year 2021-2022

References

Glover, G.W., Thomas, R.M., Vamvakas, G. *et al.* Intravascular versus surface cooling for targeted temperature management after out-of-hospital cardiac arrest – an analysis of the TTM trial data. *Crit Care* **20,** 381 (2016). https://doi.org/10.1186/s13054-016-1552-6
Kupchik, Nicole L. "Development and Implementation of a Therapeutic Hypothermia Protocol." *Critical Care Medicine*, vol. 37, no. Supplement, 2009, doi:10.1097/ccm.0b013e3181aa61c5.
Nielsen N, Wetterslev J, Cronberg T, Erlinge D, Gasche Y, Hassager C, et al. Targeted temperature management at 33 degrees C versus 36 degrees C after cardiac arrest. N Engl J Med. 2013;369:2197–206
Schenone, Aldo L., et al. "Therapeutic Hypothermia after Cardiac Arrest: A Systematic Review/Meta-Analysis Exploring the Impact of Expanded Criteria and Targeted Temperature." *Resuscitation*, vol. 108, 2016, pp. 102–110., doi:10.1016/j.resuscitation.2016.07.238.
"Targeted Temperature Management (Therapeutic Hypothermia)." *Practice Essentials, Overview, Pathophysiology*, 12 Nov. 2019, emedicine.medscape.com/article/812407-overview#a1.