



Center for Health Systems Innovation

Transforming Rural and Native American Health

Mortality Analysis: Digoxin and Diltiazem in Patients with Atrial Fibrillation

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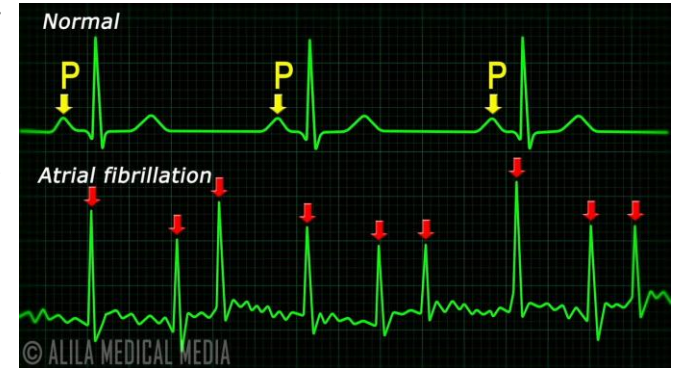
Outline

- Introduction and Motivation
- Objective
- Methodology
- Results and Discussion
- Future Research



Atrial Fibrillation

- Atrial fibrillation (AF) is a quivering or irregular heartbeat (arrhythmia) that can lead to blood clots, stroke, heart failure and other heart-related complications
- At least 2.7 million Americans are living with AF
- Two-thirds of patients with chronic atrial fibrillation (AF) require drug treatment to control ventricular response rate
- Digoxin is a heart rate control drug that has been used for more than a century, although digoxin has never undergone the standard FDA approval



Objective

- Recent studies have cast doubt on the benefit of digoxin in contemporary heart failure treatment
- The purpose of this study was to compare mortality rates among AF patients prescribed either digoxin or diltiazem
- Use demographic and hospital-associated variables plus drug type to predict mortality

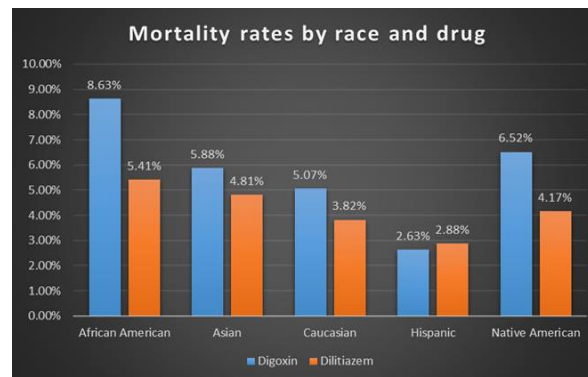
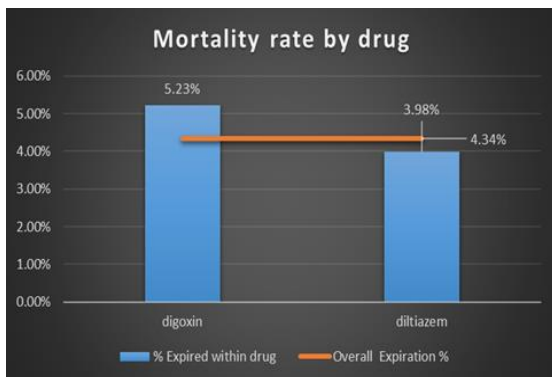


Methodology

- Data came from a clinical dataset donated to Oklahoma State University by the Cerner Corporation
- Analysis was conducted using data from 52,775 patients diagnosed with AF (ICD-9 CM 427.31) and prescribed either digoxin or diltiazem
- Intense cleaning process included removal of records with missing, unknown, or null values
- Comparisons of mortality rates were done using Chi-Sq. tests between different races, genders, and combination of both gender and race
- A logistic regression model was created to identify potential predictors for mortality



Descriptive Statistics



Population	Total Number of Patients	No. of patients expired	% Mortality rate within population	P-Value
Male	26851	1206	4.49%	0.6156
Female	25924	1141	4.40%	
Digoxin	19597	1025	5.23%	<0.0001
Diltiazem	33178	1322	3.98%	
African American	3490	219	6.28%	<0.0001
Asian	465	24	5.16%	
Caucasian	46248	1986	4.29%	
Hispanic	427	12	2.81%	
Native American	118	6	5.08%	

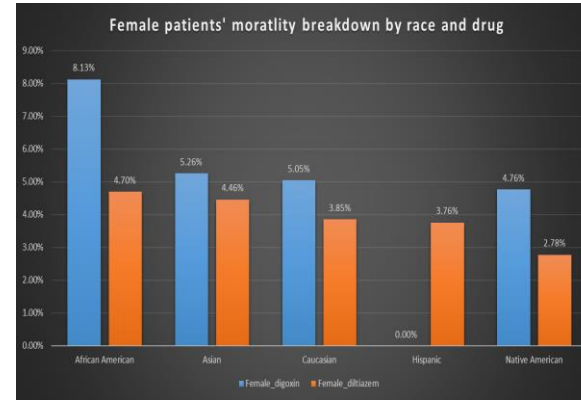
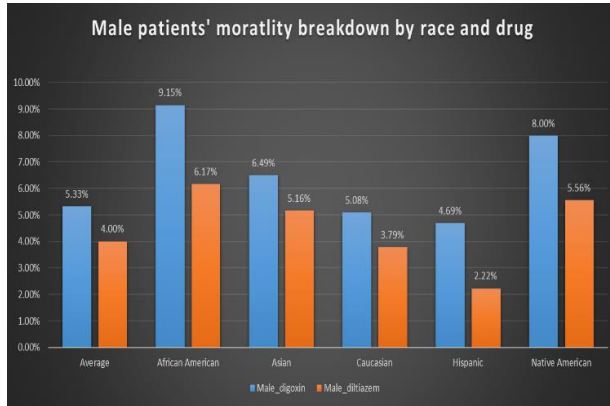


Descriptive Statistics

- Digoxin-associated mortality was significantly higher than diltiazem-associated mortality [5.23 vs 3.98%, RR 1.31, CI 1.21-1.42, $p < 0.001$]
- Patients who were prescribed digoxin had 1.31 times the risk of expiring than the patients who were prescribed diltiazem
- African Americans had the highest mortality rate compared to other races
- The age (in years) and length of stay (in days) of patients with digoxin intake was significantly higher than that of diltiazem patients [74.96 vs 68.45, $p < 0.0001$; 5.95 vs 4.99, $p < 0.0001$]



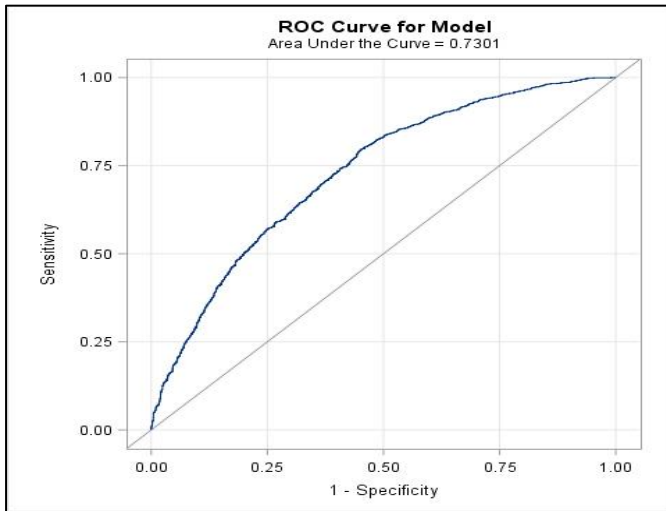
Descriptive Statistics



Population	Drug	Total Number of Patients	No. of patients expired	% Mortality rate within population	P-Value
African Americans	Digoxin	939	81	8.63%	0.0005
	Diltiazem	2551	138	5.41%	
Male African Americans	Digoxin	459	42	9.15%	0.0327
	Diltiazem	1231	76	6.17%	
Female African Americans	Digoxin	480	39	8.13%	0.0052
	Diltiazem	1320	62	4.70%	
Caucasians	Digoxin	17577	891	5.07%	<.0001
	Diltiazem	28671	1095	3.82%	
Male CA Digoxin vs Diltiazem	Digoxin	8891	452	5.08%	<.0001
	Diltiazem	14609	553	3.79%	
Female CA Digoxin vs Diltiazem	Digoxin	8686	439	5.05%	<.0001
	Diltiazem	14062	542	3.85%	
Hispanic	Digoxin	114	3	2.63%	0.2592
	Diltiazem	313	9	2.88%	
Male Hispanic Digoxin vs Diltiazem	Digoxin	64	3	4.69%	0.3828
	Diltiazem	180	4	2.22%	
Female Hispanic Digoxin vs Diltiazem	Digoxin	50	0	0%	0.3251
	Diltiazem	133	5	100%	
Asian	Digoxin	153	9	5.88%	0.6226
	Diltiazem	312	15	4.81%	
Male Asian Digoxin vs Diltiazem	Digoxin	77	5	6.49%	0.7637
	Diltiazem	155	8	5.16%	
Female Asian Digoxin vs Diltiazem	Digoxin	76	4	5.26%	0.7521
	Diltiazem	157	7	4.46%	



Predictive Modeling



Type 3 Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
LOS	1	247.3507	<.0001
age_in_years	1	84.4454	<.0001
PAYER_CODE_DESC	16	21.9905	0.1435
race	4	12.2709	0.0154
Gender	1	7.4043	0.0065
GENERIC_NAME	1	12.4349	0.0004

- A logistic regression model was built, which suggested that variables such as length of stay, age, race, gender, and drug type are important in predicting the probability of mortality [C statistics or area under the curve (AUC) 0.730]



Results and Discussion

- From the descriptive statistics it is clear that digoxin associated mortality is more than diltiazem associated mortality in atrial fibrillation patients
- The race and gender comparisons shows that except for Hispanic patients the mortality rates are significantly higher for digoxin prescribed patients
- The logistic regression model also suggested that patients with digoxin intake in the data had higher odds of expiring than patients who took diltiazem during their visit



Future Research

- Include comorbidities such as stroke, hypertension, diabetes etc. and relevant lab values for the same patient population to improve the predictive power of the model
- Include verapamil into our research for comparison
- Develop different models such as decision tree, Bayesian network, etc.



THANK YOU
QUESTIONS?

