An Exploratory Analysis of Alzheimer's and Dementia Patient Disposition Following Hospital Admission in Maryland

MPH Capstone
May 11th, 2022

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Agenda

- Burden of Alzheimer's & Dementia
- What Happens When Patients Can't Be Taken Care of At Home?
- Existing Literature
- Capstone Question
- Dataset
- Exploratory Analysis

Burden of Alzheimer’s & Dementia

6M+

Patients in the US Live With Alzheimer's

1/3

Of Seniors Die with Either Alzheimer's or Dementia

83%

Of Help Provided to Seniors Comes from Family or Friends

"$271.6 Billion Worth of Care is Provided by Family Members and Other Unpaid Caregivers"

Source: Alzheimer's Association

What Happens When Patients Can’t Be Taken Care of At Home?

- Skilled Nursing Facilities
- Assisted Living Facilities
- Alzheimer’s Special Care Units
- Life Plan Communities

Source: Alzheimer’s Association

What Influences the Likelihood of Being Admitted to a Non-Home Location?

Existing Literature:

1. Poor cognition, behavior, and psychological symptoms[1]
2. Incidence of Hip Fracture prior to diagnosis[1]
3. Advice of Patient's Physician[2]
4. Advice of Social Workers[2]

Source: Toot et al. (2016)[1]
Cox et al. (1996)[2]

Capstone Question:

What Other Factors May Be Associated With Ending Up at a Non-Home Location?

Maryland Health Services Cost Review Commission (HSCRC) Non-Confidential Inpatient and Hospital-Based Outpatient Data Set

- De-identified Hospital Discharge Data from Maryland
- Detailed Diagnoses Data
- FY 2017 - 2019
- “**Disposition**” Data

Exploratory Analysis

Patient Count of Alzheimer's & Dementia Related Patients

Financial Year	Total Patient Count
2017	41,656
2018	40,885
2019	41,278
Total	123,819

Diagnosis Type	Financial Year	Total Patient Count
Alzheimer	2017	7,467
Alzheimer	2018	6,705
Alzheimer	2019	6,209
Dementia	2017	34,189
Dementia	2018	34,180
Dementia	2019	35,069
Total	-	123,819

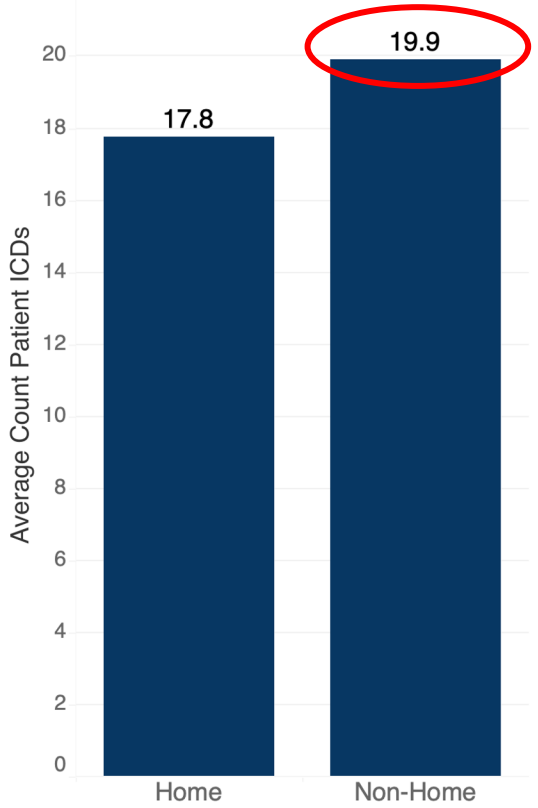
Percentage Breakdown of Source & Discharge Disposition

	Home (Discharge)	Non-Home (Discharge)	Total
Home (Source)			
Non-Home (Source)			

Percentage Breakdown of Source & Discharge Disposition

	Home (Discharge)	Non-Home (Discharge)	Total
Home (Source)	43.4%	56.6%	100% (n = 93,924)
Non-Home (Source)	22.9%	77.1%	100% (n = 29,892)

Average Count of ICDs Per Patient by Discharge Disposition



Percentage Breakdown of Diagnosis Type by Discharge Disposition

	Home (Discharge)	Non-Home (Discharge)	Total
Alzheimer's	40.0%	60.0%	100% (n = 20,381)
Dementia	38.1%	61.9%	100% (n = 103,435)

Percentage Breakdown of Sex by Discharge Disposition

	Home (Discharge)	Non-Home (Discharge)	Total
Male	37.8%	62.2%	100% (n = 52,710)
Female	38.9%	61.1%	100% (n = 71,106)

Percentage Breakdown of Age by Discharge Disposition

Age (Years)	Home (Discharge)	Non-Home (Discharge)	Total
0-49	60.3%	39.7%	100% (n = 2,163)
50-59	48.1%	51.9%	100% (n = 4,287)
60-69	40.5%	59.5%	100% (n = 12,912)
70-79	39.0%	61.0%	100% (n = 30,816)
80-89	37.1%	62.9%	100% (n = 48,682)
90-99	35.6%	64.4%	100% (n = 24,168)
100+	38.2%	61.8%	100% (n = 788)

Percentage Breakdown of Patient Race by Discharge Disposition

Race	Home (Discharge)	Non-Home (Discharge)	Total
White	37.7%	62.3%	100% (n = 77,383)
Black or African-American	39.0%	61.0%	100% (n = 39,474)
Asian	43.7%	56.3%	100% (n = 2,442)
American Indian or Alaskan Native	47.8%	52.2%	100% (n = 268)
Hawaiian or Pacific Islander	38.4%	61.6%	100% (n = 112)
Other	46.5%	53.5%	100% (n = 2,855)
Declined to Answer	33.5%	66.5%	100% (n = 528)
Unknown	34.3%	65.7%	100% (n = 522)
Multiracial	42.7%	57.3%	100% (n = 232)

Percentage Breakdown of Marital Status by Discharge Disposition

Marital Status	Home (Discharge)	Non-Home (Discharge)	Total
Single	36.3%	63.7%	100% (n = 24,086)
Married	42.2%	57.8%	100% (n = 41,725)
Widow/Widower	37.0%	63.0%	100% (n = 43,950)
Divorced	35.5%	64.5%	100% (n = 10,341)
Separated	40.0%	60.0%	100% (n = 1,356)
Unknown	32.1%	67.9%	100% (n = 2,358)

Charlson Index

What's The Charlson Index?

- Weighted Score of Co-morbidities and Age
- Designed to Predict Risk of Death On a Patient Level
- A Higher Charlson Index Score is Associated With a Higher Risk of Death

Source: Sundararajan et al. (2004)

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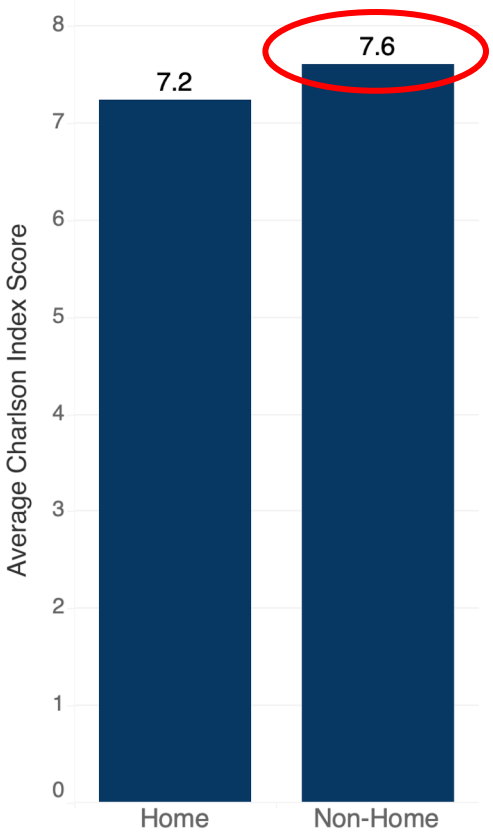

Source: Sundararajan et al. (2004)

One Tiny Problem

Lots of Potential Confounding

Multiple Logistic Regression!

Reference Group
(Multiple Logistic Regression)

Covariates	Reference Value
Y Covariate	
Discharge Disposition	Home
X Covariates	
Source of Admission	Home
Diagnosis	Dementia
Sex	Male
Race	White
Marital Status	Single

Multiple Logistic Regression (1 of 2)

Covariate	Odds Ratio	P-value
Source of Admission Non-Home	**2.550**	**<0.001**
Count of ICD	**1.058**	**<0.001**
Age	**1.036**	**<0.001**
Alzheimer	**0.918**	**<0.001**
Female	**0.896**	**<0.001**
Patient Race (American Indian or Alaskan Native)	**0.687**	**0.003**
Patient Race (Asian)	**0.871**	**<0.001**
Patient Race (Black or African-American)	1.000	0.996
Patient Race (Declined)	1.132	0.198
Patient Race (Hawaiian or Pacific Islander)	1.134	0.532
Patient Race (Multi-racial)	0.778	0.072
Patient Race (Other)	**0.775**	**<0.001**
Patient Race (Unknown)	0.918	0.380

* Bold signifies statistically significance

Multiple Logistic Regression (2 of 2)

Covariate	Odds Ratio	P-value
Marital Status (Married)	**0.685**	**<0.001**
Marital Status (Separated)	**0.828**	**0.002**
Marital Status (Divorced)	**0.924**	**0.002**
Marital Status (Widow/Widower)	**0.790**	**<0.001**
Marital Status (Unknown)	1.079	0.119
Charlson Index Score	**1.149**	**<0.001**
Interaction Term 1 (Count of ICD * Charlson Index Score)	**1.000**	**0.042**
Interaction Term 2 (Age * Charlson Index Score)	**0.998**	**<0.001**

Takeaways

1. Patient **Source** Location is Highly Associated With Discharge Location
2. Higher **Age**, **ICD Count**, and **Charlson Score** are associated with an **Increase** in Non-Home discharges
3. Being **Female**, **Asian**, **American Indian/Alaskan Native**, and **Married** are Each Associated With a **Reduction** in Non-Home Discharges

Further Areas of Interest

1. Which ICD Codes are Most Associated with Non-Home Discharge
2. Hospital Length of Stay
3. Patient Zipcode of Residence

Learnings & New Competencies

Data Prepping	Data Analysis	Conceptual

• ICD Coding Crosswalk
• Charlson Index Calculation
• Working with Large Datasets
	• Microsoft Access
	  ○ SQL
	  ○ Subqueries
	  ○ Joins
	  ○ Group Bys
	• R
	  ○ Filtering Data
	  ○ Casting Covariates Data Types
	  ○ Logistic Regression
	  ■ Reordering reference groups
	  ○ Recoding Covariates
	  ○ Scatterplots
	  ○ Object-Oriented Programing
	• Tableau
	  ○ Custom visuals
		• Working with Discharge Data
		• Charlson Index & Quantifying Comorbidity Severity
		• Alzheimer's and Dementia familiarity
		• Formulating a narrow problem out of a vast dataset

Acknowledgments

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Questions?

References

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