

Characterizing Cardiovascular Disease Patients in US Community Hospitals Using insightsDB

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Objective

To investigate the characteristics of patients with cardiovascular disease (CVD) from insightsDB, a database which collates electronic medical record (EMR) data from US community hospitals.

Background

- Commercially available US real-world data often come from employer-sponsored insurance plans or major provider networks, leading to underrepresentation of patients with lower socioeconomic status in real-world evidence (RWE) studies.
- This creates an important evidence gap in the study of CVD conditions, which are characterized by risk factors influenced by social determinants of health (SDOH) and disparities in access to quality care.
- The insightsDB database, from the Institute for Health Metrics, collates EMR data from ~100 predominantly rural US community hospitals (88% governmental or voluntary non-profit) across 30 US states. Over five million unique patients and 14 million encounters are captured, including linkage to SDOH from census tract data.¹

Methods

Comparison with Nationally Representative Databases (2017–2018)

- Adapting the methodology from Shah (2023),² we examined demographics, comorbidities, and hospital outcomes in insightsDB patients with an ICD-10 diagnosis code reporting myocardial infarction (MI), congestive heart failure (CHF), or stroke in 2017–2018. We estimated mean differences (not shown) between insightsDB hospital encounters (inpatient stays and emergency room visits) and those in two nationally representative² databases:
 - Cerner RealWorldData (CRWD), a commercial EMR database containing data from 86 US health systems.
 - National Inpatient Sample (NIS), the largest publicly available all-payer inpatient care database in the US.

Characterizing CVD in insightsDB (2017–2023)

- We further investigated characteristics of MI, CHF, and stroke patients for all available years of insightsDB data (January 2017–June 2023) by examining trends over time in incidence, length of hospital stay, and mortality.
- To explore potential reasons for the differences in hospital outcomes observed between insightsDB, CRWD, and NIS, we analyzed the relationship between length of stay and patient discharge/transfer. The mean length of stay was calculated for the five most common dispositions by indication.

Results

Comparison with Nationally Representative Databases (2017–2018)

- From 2017–2018, 33.4% of relevant insightsDB hospitalizations were for MI, 51.6% were for CHF, and 15.0% were for stroke. By comparison, 29.3% of relevant CRWD hospitalizations were for MI, 47.1% were for CHF, and 23.5% were for stroke; 28.5% of NIS hospitalizations were for MI, 54.6% were for CHF, and 16.9% were for stroke.
- As shown in **Table 1**, patients hospitalized for MI, CHF, and stroke in insightsDB were younger, more likely to be Asian American or Pacific Islander (AAPI), and less likely to be Hispanic than those in CRWD and NIS.
- Patients in insightsDB were substantially less likely to have recorded hypertension or chronic kidney disease (CKD) compared to CRWD and NIS. This discrepancy is likely due to a combination of factors including underreporting in the medical charts, population differences (e.g. younger age), or a lack of engagement with the healthcare system prior to the hospital encounter.
- insightsDB MI hospitalizations included a lower percentage of coronary artery bypass grafts (CABG) and percutaneous coronary interventions (PCI) and had shorter lengths of stay compared to CRWD and NIS.

Characterizing CVD in insightsDB (2017–2023)

- As shown in **Figure 1A**, incidence of CHF was highest, followed by MI and then stroke. The incidences of CHF and MI have increased slightly since 2017, while stroke incidence remained relatively constant.
- As shown in **Figure 1B**, the mean length of stay was consistently highest for CHF patients, while MI and stroke patients had lower but comparable mean lengths of stay. Length of stay in all three indications has decreased in recent years.
- As shown in **Figure 1C**, mortality was highest for MI patients. Mortality for all three indications peaked around 2021, likely impacted by the COVID-19 pandemic, but has since declined.
- The five most common dispositions for MI, CHF, and stroke patients are represented in **Figure 2**.
- MI patients who were transferred to a skilled nursing facility or discharged home under care of a home health service organization had the longest mean length of stay, while stroke patients discharged to a skilled nursing facility had the longest mean length of stay. Patients who were routinely discharged or transferred to a short-term general hospital had the shortest lengths of stay across all CVD indications.

Conclusion

Shorter lengths of stay, a high frequency of transfers for MI and stroke patients, and fewer reports of CABG and PCI procedures in insightsDB suggest that patients who are admitted for CVD events may need to be transferred to other hospitals in order to receive necessary care.

insightsDB presents an opportunity to investigate trends in patient care and outcomes in a unique rural population, but is limited in its ability to track procedures and outcomes following transfer or discharge. Future work should consider analysis of unstructured notes and data linkage to develop a more complete understanding of CVD care in rural hospitals.

Footnote: The scope of analyses was modified between abstract submission and poster development. Specifically, hospital encounters were filtered to include only emergency room visits and inpatient stays, and all CVD diagnoses (rather than primary diagnoses only) were considered.

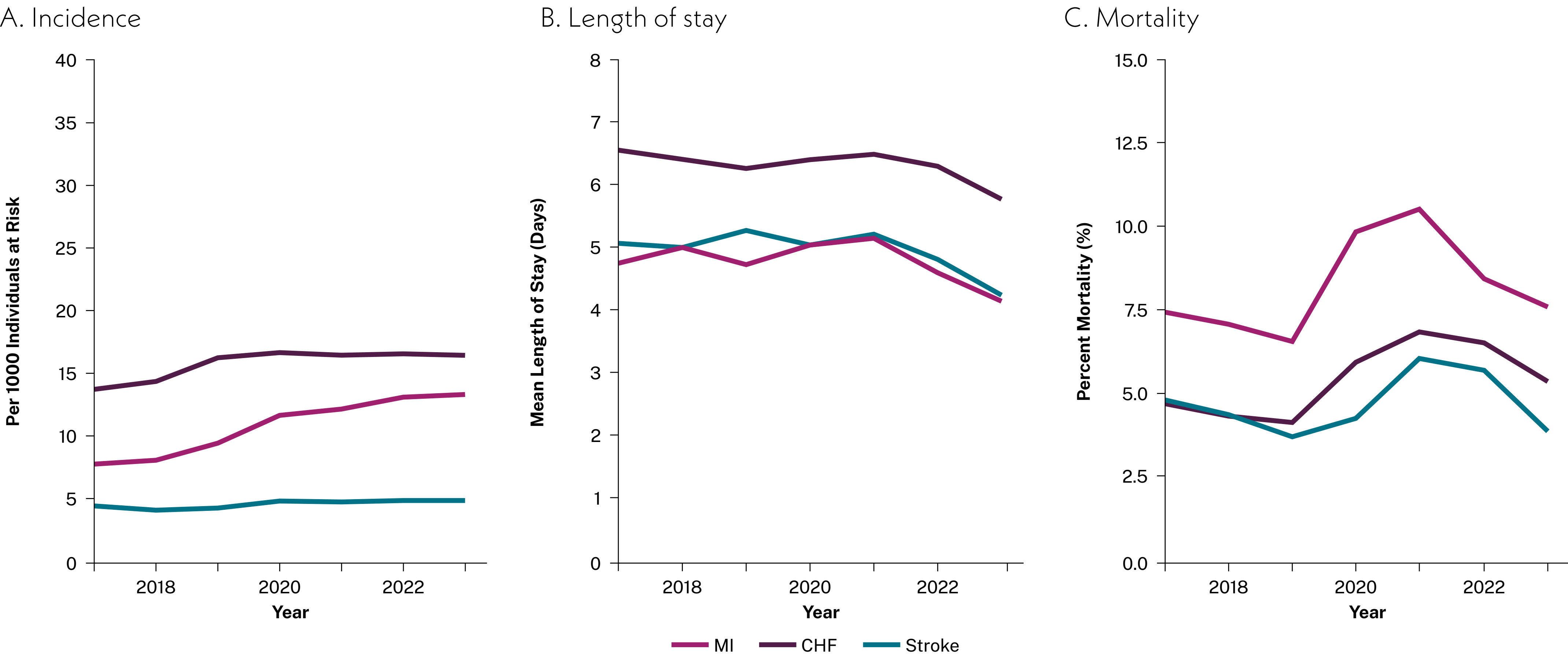
TABLE 1

Demographic and disease characteristics for MI, CHF, and stroke patients in insightsDB, CRWD, and NIS

	MI			CHF			Stroke		
	insightsDB (n=67,565)	CRWD (n=116,956)	NIS (n=2,245,300)	insightsDB (n=104,322)	CRWD (n=188,107)	NIS (n=4,310,745)	insightsDB (n=30,222)	CRWD (n=93,968)	NIS (n=1,333,480)
Age, years (SD)	66.9 (13.6)	68.5 (13.4)	68.7 (13.8)	69.3 (13.2)	71.2 (13.4)	71.8 (13.8)	67.6 (13.5)	69.6 (13.5)	69.9 (14.1)
Sex (%)									
Female	41.3%	40.7%	41.2%	46.4%	46.3%	48.2%	48.0%	49.2%	49.8%
Male	58.7%	59.3%	58.8%	53.6%	53.7%	51.8%	52.0%	50.8%	50.2%
Race/ethnicity									
Black	11.0%	12.4%	12.5%	16.3%	17.3%	17.6%	14.4%	17.8%	17.3%
White	66.3%	70.9%	72.6%	64.2%	64.8%	69.1%	65.6%	65.4%	68.0%
Hispanic	2.8%	5.3%	8.6%	1.9%	5.2%	8.2%	3.1%	6.5%	8.6%
AAPI	9.0%	3.6%	2.8%	7.6%	2.8%	2.2%	5.8%	2.7%	3.0%
Other	10.9%	7.8%	3.4%	10.0%	9.8%	2.9%	11.1%	7.6%	3.1%
Comorbidities									
Hypertension	8.1%	84.6%	81.7%	7.4%	91.2%	89.3%	9.9%	86.3%	84.0%
Diabetes	42.0%	44.9%	41.7%	51.8%	52.4%	47.0%	40.1%	42.7%	38.9%
CKD	9.1%	17.5%	14.2%	1.3%	18.9%	8.7%	9.9%	14.4%	13.3%
Hyperlipidemia	54.2%	66.9%	59.7%	56.7%	64.0%	52.3%	48.4%	62.3%	56.3%
CAD	53.8%	73.5%	70.8%	50.9%	59.1%	52.9%	23.2%	29.8%	27.2%
PAD	2.2%	6.0%	2.9%	2.1%	7.0%	2.7%	1.5%	4.7%	2.6%
Stroke	2.4%	7.2%	3.1%	1.3%	7.0%	1.5%			
CHF	26.4%	46.4%	45.0%				4.5%	22.4%	20.7%
MI				17.1%	22.3%	13.0%	5.3%	7.8%	5.2%
Hospital outcomes									
Length of stay, days (SD)	4.9 (7.3)	5.6 (9)	5.8 (7.3)	6.4 (7.4)	6.9 (9.7)	6.8 (7.5)	5.1 (9.1)	6.7 (15.9)	6.4 (9.3)
Mortality	8.2%	7.5%	8.2%	5.2%	5.3%	5.1%	4.7%	5.1%	6.6%
CABG	2.0%	6.3%	6.0%						
PCI	15.7%	30.9%	31.2%						

FIGURE 1

Trends over time in insightsDB: CVD incidence (A), length of stay (B), and mortality (C)



Abbreviations: AAPI: Asian American/Pacific Islander; CABG: coronary artery bypass grafting; CAD: coronary artery disease; CHF: congestive heart failure; CKD: chronic kidney disease; CRWD: Cerner RealWorldData; CVD: cardiovascular disease; EMR: electronic medical record; MI: myocardial infarction; NIS: national inpatient sample; PAD: peripheral artery disease; PCI: percutaneous coronary intervention; RWE: real-world evidence; SD: standard deviation; SDOH: social determinants of health.

References: ¹insightsDB. Available at: <https://www.healthmetrics.org/insightsdb> [Last accessed: 19 Apr 2024]; ²Shah N. et al. Am Heart J 2023;266:3:64–72. **Acknowledgements:** The authors thank Martina Tasende, Costello Medical, for graphic design assistance. We also thank Anita Karcz, Institute for Health Metrics, for her contributions in the preparation of this poster.

FIGURE 2

Mean length of stay (days) of insightsDB patients for the five most frequent dispositions for each indication

