

Differences in Patient Characteristics and Outcomes by Hospital Size for Patients with Chronic Liver Disease and Acute Kidney Injury or Hepatorenal Syndrome

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BACKGROUND

- Hepatorenal syndrome (HRS) and acute kidney injury (AKI) are significant complications in hospitalized patients with chronic liver disease (CLD), contributing to increased morbidity and mortality.¹
- The size of a hospital system can significantly impact available resources, infrastructure, and expertise in managing patients with complex conditions.

OBJECTIVE

- We aimed to evaluate the difference in patient characteristics and treatment by and impact of hospital size on patient outcomes among patients with CLD and AKI or HRS.

MATERIAL AND METHODS

- A retrospective, longitudinal analysis of the Premier Healthcare Database (PHD) was conducted to first identify hospitalized patients with chronic liver disease (CLD, based on ICD-10 codes, Hirode et al 2020)² between 2016-2022.
- PHD is one of the most comprehensive, HIPAA-compliant electronic healthcare databases with more than 1,041 contributing hospitals/healthcare systems in the US.
- Patient selection criteria:
 - HRS patient cohort: Adult patients hospitalized with a diagnosis of CLD and hepatorenal syndrome (HRS, ICD-10 code K76.7) between 2016 and 2021.
 - AKI patient cohort: Adult patients hospitalized with a diagnosis of CLD and acute kidney injury (AKI, ICD-10 codes N17.x) between 2016 and 2022
- Outcomes of interest
 - Overall outcomes were stratified by hospital size: small (<100 beds), medium (100-499 beds), and large (500+ beds).
 - Trends in in-hospital mortality and health care resource use (HCRU, hospital length of stay (LOS), total hospitalization charges) were evaluated for CLD patients with HRS or AKI.
 - Annual incidence rates for patients with HRS or AKI in the US were calculated using estimates based on AHA (American Hospital Association) inpatient projection weight in the PHD database.³
- All analyses were conducted using RStudio.

Table 1. Patient demographics, insurance, and clinical characteristics at index

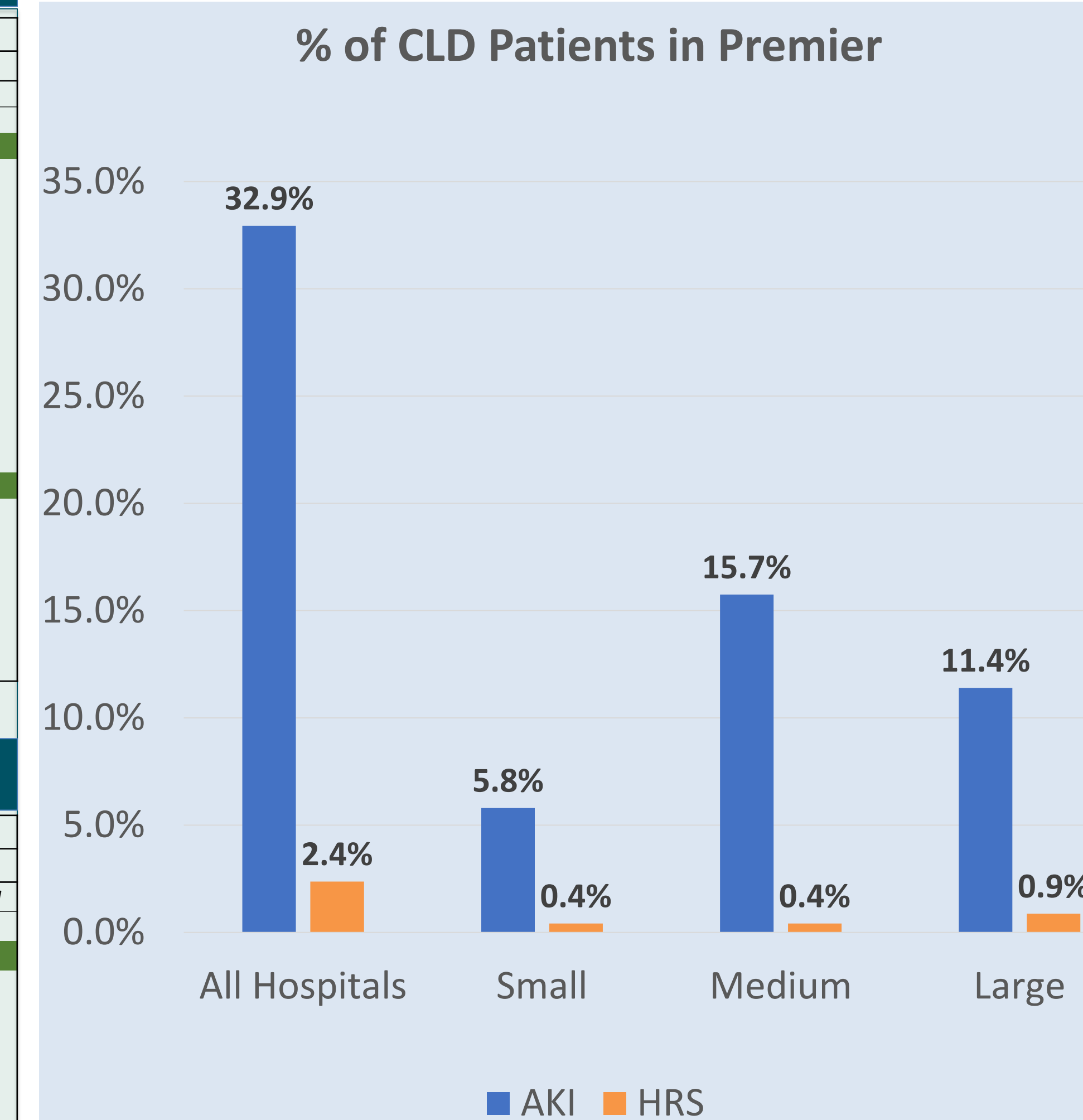
	CLD with AKI						CLD with HRS					
	Small Beds		Medium beds		Large Beds		Small Beds		Medium beds		Large Beds	
	N	mean %	N	mean %	N	mean %	N	mean %	N	mean %	N	mean %
# of patients	173,397		470,981		340,877		12,350		32,614		25,991	
Baseline characteristics												
Age (years)	64	15	64	15	62	16	60	13	60	13	58	13
Female	100,753	58%	276,231	59%	202,123	59%	7,422	60%	20,046	61%	15,922	61%
Race												
White/Caucasian	122,377	71%	312,820	66%	202,280	59%	8,733	71%	22,021	68%	15,894	61%
African American/Black	19,288	11%	72,288	15%	63,699	19%	797	6%	2,836	9%	2,732	11%
Mixed	16,438	9%	41,566	9%	38,280	11%	1,645	13%	4,261	13%	3,739	14%
Other/Unknown*	15,294	9%	44,307	9%	36,618	11%	1,175	10%	3,496	11%	3,626	14%
Insurance coverage												
Medicare	97,714	56%	261,420	56%	181,517	53%	5,548	45%	13,851	42%	10,284	40%
Medicaid	30,097	17%	91,083	19%	66,171	19%	3,014	24%	8,822	27%	6,794	26%
Commercial	29,046	17%	77,725	17%	61,833	18%	2,469	20%	6,461	20%	6,473	25%
Other	16,540	10%	40,753	9%	31,356	9%	1,319	11%	3,480	11%	2,440	9%
Clinical characteristics												
Comorbidities of Interest												
Acute Kidney Injury	173,397	100%	470,981	100%	340,877	100%	11,160	90%	30,136	92%	24,240	93%
Ascites	13,882	8%	37,006	8%	29,644	9%	5,919	48%	15,859	49%	13,439	52%
Alcohol Related Disease	39,685	23%	100,412	21%	70,889	21%	7,285	59%	18,964	58%	15,370	59%
Diabetes	73,083	42%	201,089	43%	141,779	42%	4,346	35%	11,531	35%	8,940	34%
Infection	30,022	17%	86,870	18%	62,762	18%	1,384	11%	4,373	13%	3,577	14%
Sepsis	62,642	36%	180,472	38%	126,623	37%	4,107	33%	11,490	35%	9,100	35%

* Including Asian, Hispanic, and other/unknown.

Table 2. Outcomes of interest, treatment patterns, HCRU, and discharge status

	CLD with AKI						CLD with HRS					
	Small Beds		Medium beds		Large Beds		Small Beds		Medium beds		Large Beds	
	N	mean %	N	mean %	N	mean %	N	mean %	N	mean %	N	mean %
# of patients	173,397		470,981		340,877		12,350		32,614		25,991	
Outcomes of interest												
CLD Related Comorbidities												
Hepatic failure unspecified	16,224	9%	43,802	9%	33,757	10%	4,728	38%	12,854	39%	10,501	40%
Alcoholic cirrhosis	19,417	11%	48,716	10%	36,127	11%	6,645	54%	17,289	53%	14,249	55%
Alcoholic hepatic failure	3,531	2%	9,037	2%	7,255	2%	2,161	17%	6,058	19%	5,425	21%
All fibrosis and cirrhosis of liver	33,793	19%	87,330	19%	62,512	18%	4,394	36%	11,964	37%	9,470	36%
Other unspecified cirrhosis of liver	32,848	19%	84,922	18%	60,343	18%	4,297	35%	11,711	36%	9,216	35%
Portal hypertension	15,066	9%	43,075	9%	35,299	10%	5,073	41%	14,765	45%	13,470	52%
Esophageal varices	8,690	5%	24,909	5%	20,446	6%	2,746	22%	8,469	26%	8,161	31%
Hepatocellular carcinoma	4,980	3%	13,857	3%	12,363	4%	986	8%	2,670	8%	2,556	10%
Treatment pattern at index												
Drug Categories												
Albumin	49,271	28%	157,677	33%	129,412	38%	9,943	81%	27,325	84%	22,627	87%
Midodrine HCL	10,077	6%	32,528	7%	26,804	8%	5,652	46%	17,098	52%	15,282	59%
Ocreotide	15,069	9%	52,453	11%	40,397	12%	6,349	51%	18,933	58%	16,319	63%
Norepinephrine	44,825	26%	151,005	32%	125,781	37%	3,757	30%	12,117	37%	11,173	43%
# of different drug categories among patients in cohort	0.69	0.92	0.84	1.00	0.95	1.04	2.08	1.23	2.31	1.23	2.52	1.22
# of claims different drug categories among patients in cohort	4.09	12.98	5.38	15.10	7.56	22.57	32.22	55.06	41.50	60.68	63.85	93.86
HCRU (follow-up period)												
Hospital Length of Stay (days)	7	9	9	11	11	15	7	8	9	9	11	14
Duration of ICU admissions (days)	9	10	10	11	13	17	9	8	8	8	10	13
Readmission (within 30 days)	13,563	8%	42,260	9%	33,147	10%	3,982	32%	12,018	37%	9,039	35%
Total Charges (US \$)	21,442	38,476	26,335	227,056	38,165	84,889	20,972	30,904	25,193	179,847	44,352	90,803
Discharge location (follow-up period)												
Died/Hospice	40,236	23%	128,325	27%	100,247	29%	5,581	45%	15,561	48%	12,323	47%
Healthcare Facility	43,417	25%	109,313	23%	73,692	22%	2,971	24%	6,654	20%	4,923	19%
Home	85,707	49%	220,890	47%	159,394	47%	3,590	29%	9,838	30%	8,390	32%
Other	4,037	2%	12,453	3%	7,544	2%	208	2%	561	2%	355	1%

Figure 1. Percent of HRS and AKI Hospitalizations by Hospital Size among CLD Hospitalizations in the PHD (2016-2022)

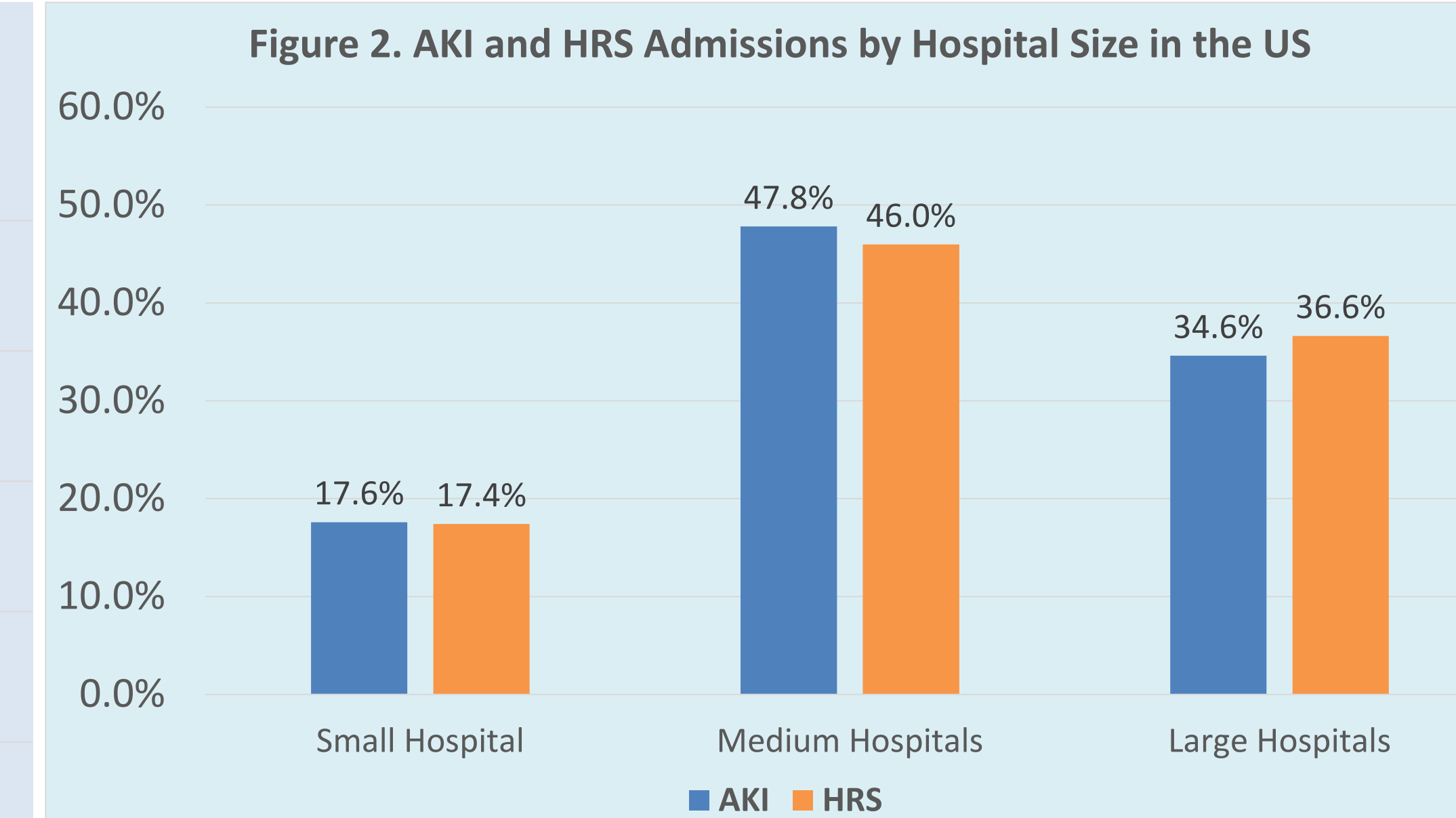


RESULTS

Patient population

- A total of 2,991,056 CLD hospitalizations were identified, representing 7.9% of all admissions during the study period.
- Of those CLD hospitalizations, 985,255 had AKI (32.9%) and 70,955 had HRS (2.4%).
- Compared to small and medium hospitals, large hospitals had a slightly higher proportion of African Americans (AA) and patients with commercial insurance.
- The HRS cohort was younger (59 vs. 63 years) and had a smaller proportion of AA (9% vs. 16%) compared to the AKI cohort (Table 1).

Figure 2. Percent of AKI and HRS Admissions by Hospital Size in the PHD (2022-2022)



LIMITATIONS AND CONCLUSIONS

Limitations

- The analysis is based on the PHD database and is affected by misclassification bias associated with the hospital patient level encounter data.
- Patients with CLD, HRS and AKI were identified based on diagnosis codes (ICD-10) on the hospital claim.
- The estimated annual incidences of HRS and AKI were based on the AHA inpatient projection weight designed to project national inpatient counts (based on the AHA Annual Survey Database™)³.

Conclusions

- CLD patients with AKI or HRS had a high risk of in-hospital mortality and CLD-related complications, with HRS significantly higher than AKI alone.
- There are significant variations in patient characteristics and outcomes based on hospital size. Further research is required to evaluate how patient characteristics and hospital size impact treatment and outcomes, considering the important role small and medium hospitals play in providing care.

References

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- Hirode et al Trends in the Burden of Chronic Liver Disease Among Hospitalized US Adults. JAMA Network Open. 2020;3(4):e201997. doi:10.1001/jamanetworkopen.
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