

PRHI Readmission Brief

Data-Guided Hot Spotting: Characterizing Frequently Admitted Patients

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Introduction

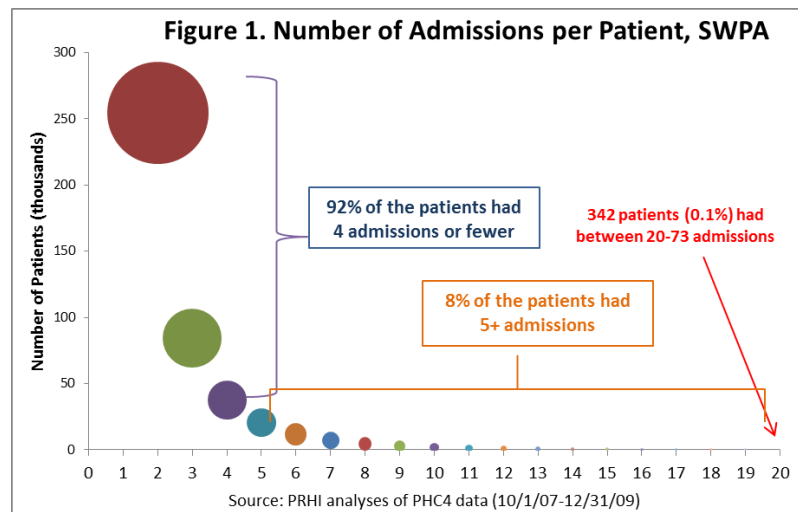
Across healthcare settings, small groups of patients account for a disproportionate share of healthcare utilization and costs. For example, an Agency for Healthcare Research and Quality (AHRQ) analysis of U.S. healthcare expenditures found that 5% of the population accounted for nearly half of total medical expenditures and the top 30% of the population accounted for 89% of total expenditures.¹ These disproportionate national patterns hold true even at the local level. Brenner (2009) found that 20% of the patients at a single hospital in Camden, NJ accounted for 90% of costs.² Although clearly a driver of overall utilization and costs, a complete picture of the impact of frequent hospitalizations would include extraordinarily high human costs (measured in quality of life, morbidity, length of stay, impact on caregivers, and comorbidity of hospitalization itself).

Given the significant contribution of inpatient costs to overall healthcare costs and poor quality of life, interventions designed to prevent avoidable admissions and readmissions could benefit from improved targeting of high utilizers. **The purpose of this PRHI Readmission Brief is, therefore, to describe the demographics and diagnostic characteristics of inpatient high utilizers in western Pennsylvania.** Using all-payer administrative data, our findings highlight the role of a constellation of behavioral health comorbidities, specific diagnoses, and socioeconomic obstacles as key characteristics of the small segment of the population that consumes a disproportionate share of healthcare services.

Methods & Study Population

This observational study utilizes all-payer, inpatient discharge data collected by the Pennsylvania Health Care Cost Containment Council (PHC4)³ for an 11-county region of 2.6 million people in southwestern Pennsylvania. The data set includes information on all discharges between October 1, 2007 and December 31, 2009 of patients 18 and older from all acute care hospitals.⁴

Despite the disadvantages of using administrative/claims data (e.g., older data, DRG coding affected by revenue optimization software, and ICD-9 codes that depend on physician attestation), the advantages of large denominators, standardized input with all discharges, and inclusion of all payers make these data particularly advantageous.



Researchers have used a variety of definitions to identify high utilizers.⁵ After examining the distribution of admissions across patients, we chose to focus on the tail end of the distribution – the 8% of patients in southwestern PA who had at least five admissions in the nine quarter data set (see Figure 1). Consistent with other definitions of high utilizers, our sample accounts for a disproportionate share of inpatient costs. Over all of their admissions in the nine quarters of our data, the average high utilizer’s cumulative total hospital charges⁶ were five times more than the average for all other patients (\$290,902 vs. \$58,180). Using this definition, Table 1 compares High Utilizers (HUs) to the benchmark of all other patients.

Table 1. Summary of Study Populations		
	High Utilizers	All Others
Number of Patients	32,426 (8%)	396,802
Number of Admissions	232,069 (27%)	617,054
Average Admissions per Patient	7.2	1.6
Average Cumulative Length of Stay per Patient	50 days	8 days
Average Cumulative Charge per Patient	\$290,902	\$58,180
Cumulative Total Charges	\$9.4 billion	\$23 billion

Using matched age and gender cohorts, we summarize characteristics of HUs, primarily on their *index*, or first admission, along the following dimensions:

- Demographics: Race, gender, age & socioeconomic status (using payer as proxy)
- Disease Severity: Hospital length of stay, hospital charges & discharge status
- Behavioral Health Comorbidities: Depression & substance use disorders
- Diagnoses: Unique and common diagnoses, common comorbidities & changes over multiple admissions

I. Demographics

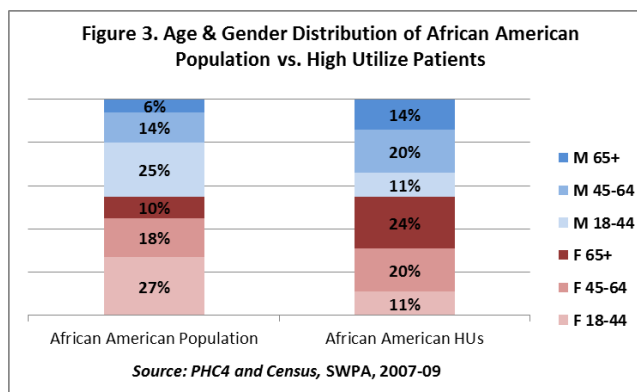
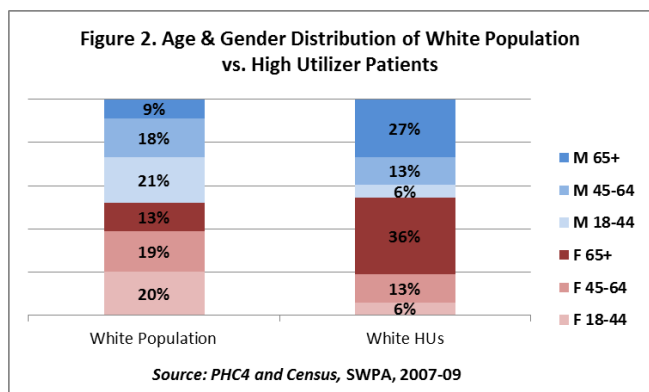
a. Gender, Race & Age

The study grouped adult patients in three age groups (by age on index admission). Here we look at the combination of age, gender and race. While overall, 54% of both High Utilizers (HUs) and all other patients (Others) are female, differences emerge by race. In southwestern Pennsylvania, African Americans constitute the largest (8% of population) and almost the only minority group with more than 1-2% of the population. Recognizing that inaccuracies in race data often undercount members of ethnic and racial minority groups, we focus in Table 2 on the differences between white HUs and white Others, and on the differences between African American HUs and Others.

Table 2. White Patients			
		White High Utilizers	All Other White
Females	18-44	6%	10%
	45-64	13%	17%
	65+	36%	28%
Males	18-44	6%	9%
	45-64	13%	16%
	65+	27%	20%

African American Patients			
		African American High Utilizers	All Other African American
Females	18-44	11%	17%
	45-64	20%	22%
	65+	24%	17%
Males	18-44	11%	16%
	45-64	20%	18%
	65+	14%	10%

- White HUs – both males and females – are more likely to be age 65+ than are All Other White patients: 36% of white HUs are female vs. 28% of Others; and 27% are males 65+ vs. 20% of Others.
- This is also true for 65+ year old African American females (24% of HUs vs. 17% of Others), but much less so for African American males (14% of HUs vs. 10% of Others).

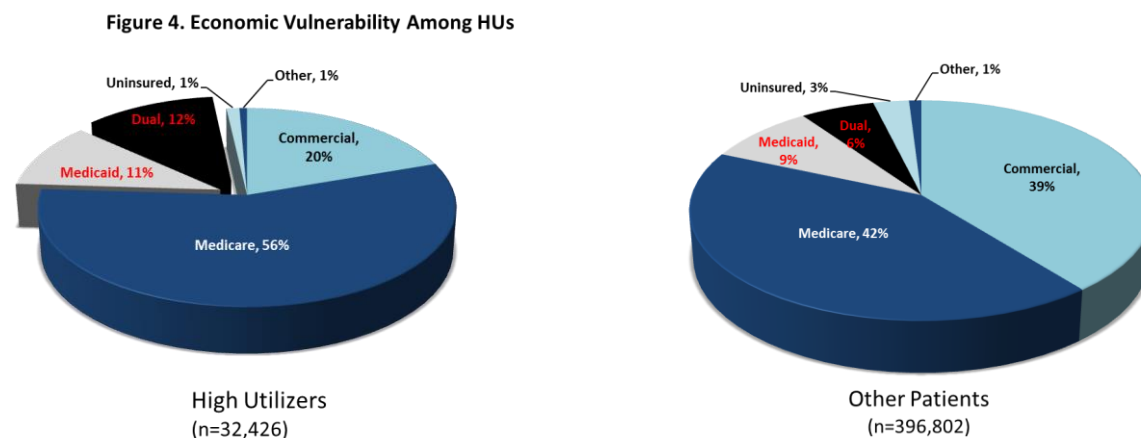


Comparing the distribution of HUs in both race/gender/age groups to that of the region's overall population highlights racial differences in the composition of the HU cohort. Figures 2 and 3 compare the distribution of both the white and African American populations to those corresponding HU patients:

- Predictably, young adults (18-44) of both races were underrepresented among the HUs relative to their population distribution.
- Among whites, the 45-64 cohort of HUs was also underrepresented: More than one third (37%) of the population of white males and females is 45-64 years old, compared to only 25% of HUs.
- By contrast, males and females aged 65+ represent the majority of white HUs (63%) but just 22% of the overall white population.
- This is strikingly different from the region's African American HUs. While individuals 65 years of age and older make up 63% of white HUs, they are only 38% of African American HUs. As with whites, African American females aged 65+ comprise the largest portion of African American HUs, but to a lesser extent than their white counterparts. Beyond this oldest cohort of females, the most prominent group of African American HUs is males aged 45-64: 20% of HUs are 45-64 year old males vs. 24% of the population – a mirror image of white HUs. Overall, 40% of African American HUs are 45-64 year olds, compared to 26% of white HUs, reflecting the earlier onset of disease and disability among African Americans.

b. Socioeconomic Status

While income data are not part of our data set per se, we use both Medicaid coverage (the eligibility for which is income dependent) and dual Medicaid and Medicare eligibility (typically available to low income seniors or to those with health problems so serious that employment is often impossible) as proxies for socioeconomic status claims. As seen in Figure 4, on their index admission, HUs are half as likely to be commercially-insured than non-HUs (20% vs. 39%). Almost a quarter (23%) of HUs are insured via the Medicaid program or are dually-eligible for



both Medicaid and Medicare compared to 15% of non-HUs. Eligibility for both kinds of insurance is income-dependent, pointing to higher levels of economic vulnerability among HUs.

Table 3 shows that such economic vulnerability appears to be correlated with increasing number of admissions. The index admission column shows the percentage of HUs by age/gender group who were dually eligible on their first admission in our data set, followed by the percent that were dually eligible on their 5th admission (all HUs had at least five admissions). Not all HUs went on to have 10 admissions, but among those who did, the percent that were dually eligible continued to increase.

Table 3. Change in Percent of High Utilizers Who Were Dually-Eligible, Index to 10 th Admission						
		Index Admission	5th Admission	10 th Admission	Change from Index to 5 th Admission	Change from Index to 10 th Admission
Females	18-44	14%	16%	19%	10%	34%
	45-64	14%	15%	20%	7%	36%
	65+	13%	16%	25%	23%	94%
Males	18-44	14%	15%	22%	6%	54%
	45-64	12%	14%	19%	13%	58%
	65+	7%	9%	13%	32%	86%

- Individuals ages 65 and older experienced the greatest increases in dual-eligible status, potentially indicating increasing economic vulnerability over time. Eligibility jumped 23% between the index and 5th admission for females and 32% for males. Eligibility nearly doubled between the index and 10th admission (86% for males and 94% for females).
- As reflected in dual eligible status, the absolute level of economic vulnerability was higher among 65+ year old females than among 65+ year old males on the index, 5th and 10th admissions (compare shaded rows).

II. Disease Severity

In this section we look at three proxy measures for disease severity: hospital length of stay (LOS) and total hospital charges (which are clearly correlated), and discharge status.

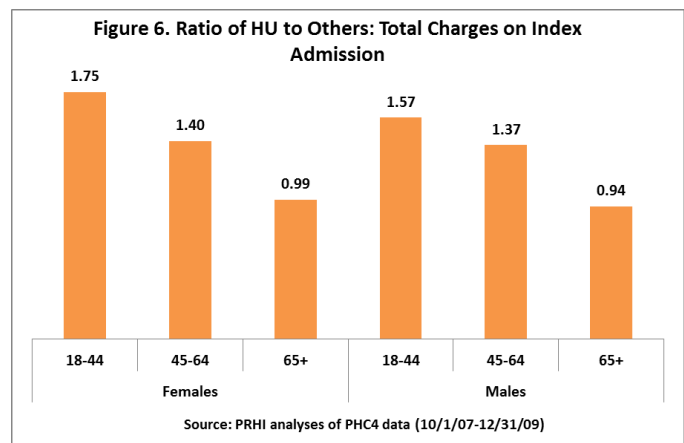
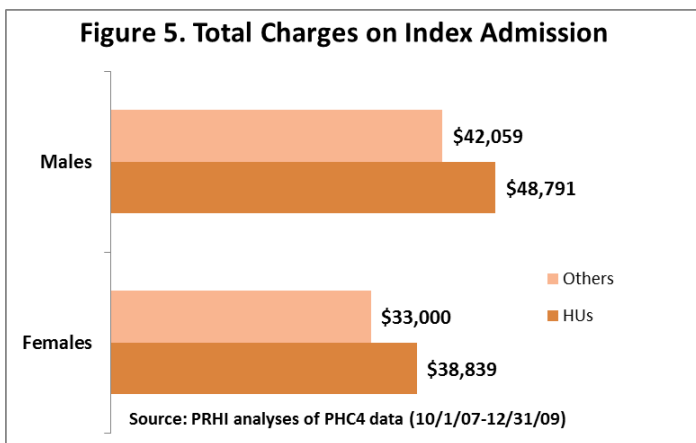
a. Hospital Length of Stay

Table 4 compares length of stay (LOS) on the index admission in both cohorts. Overall, LOS for HUs is higher for all age groups, with differences more apparent among the youngest cohort, where LOS was almost 75% longer among HUs.

Table 4. Average LOS Stay (in days) on Index Admission			
		High Utilizers	All Others
Females	18-44	6.6	3.8
	45-64	6.9	4.2
	65+	6.0	5.0
Males	18-44	7.7	4.4
	45-64	7.1	4.5
	65+	6.1	5.1

b. Average Hospital Charges

Next, we assume that hospital charges reflect patient disease severity or complexity. Because hospital charges are not what insurance companies ultimately pay for a given hospitalization, we would like to draw attention to relative, rather than absolute differences between the cohorts. To control for the fact that severity is likely to increase over time, we compare total charges just on the index admission. Figure 5 shows that index charges are between 16% and 18% more costly for HUs than non-HUs. Figure 6 looks at the ratio between total charges for HUs vs. Other patients on index admission to identify the groups with highest relative levels of severity. As with LOS, which highlighted especially big differences for younger patients, Figure 6 shows that youngest HUs are between 57% and 75% more expensive than their non-HU counterparts.



c. Discharge Status

Finally, we look at discharge status as a proxy for severity. Patients “discharged or transferred to home under care of organized home health services in anticipation of covered skilled care” are likely to be more fragile than those routinely discharged home. Table 5 compares the percentage of patients in each age/gender group that was discharged home with home health care. The data show that both younger and older HUs are more likely to be discharged with home health care on their index admission than Others.

Table 5. Percent Discharged Home with Home Health Care on Index Admission				
		High Utilizers	All Others	Percent by Which HUs Are Higher
Females	18-44	10%	6%	60%
	45-64	16%	15%	9%
	65+	23%	20%	16%
Males	18-44	9%	7%	28%
	45-64	14%	14%	0%
	65+	20%	19%	7%

III. Behavioral Health Comorbidities

As we improve our understanding of behavioral health comorbidities, our research has continually found evidence of comorbid behavioral health problem in complex patients. We explore this issue in this section by examining the prevalence of depression and/or substance use disorders (excluding tobacco use) as either the principal or secondary diagnosis (the data provide up to eight secondary diagnoses) among HUs.⁷ It is important to point out that, with only nine categories for primary and secondary diagnoses, depression and substance use disorders (SUDs), even if present, may not be coded. This is because hospital coding software selects for highest-reimbursement comorbidities (particularly if the field for possible diagnoses is limited to a certain number of slots, as with these PHC4 data). As such, conditions that are present on admission may not be part of the coded diagnoses.

a. Depression

A large survey of the general U.S. population between 2006 and 2008 found that 9% of respondents met the criteria for depression and 3.4% for major depression, with women more likely than men⁸ and people with chronic diseases more likely than others⁹ to report major depression. With this in mind, rates of diagnosed depression on index admission in Table 6 may not be surprising. HUs are more likely than Others, in every cohort, to have documented depression.

Rates are highest (in both cohorts) among 18-44 year olds. Note also that women are more likely to have diagnosed depression in every age group. This may be because depression is underdiagnosed among both men and the elderly. In addition, as mentioned above, older patients are more likely to have multiple comorbid conditions, filling the diagnostic slots in the data set with other comorbidities.

Table 6. Percent of HUs with Documented Depression on Index Admission				
		High Utilizers	All Others	Percent by which HUs are Higher
Females	18-44	25%	19%	30%
	45-64	20%	17%	20%
	65+	11%	9%	16%
Males	18-44	22%	14%	55%
	45-64	14%	9%	50%
	65+	6%	5%	19%

Table 7 raises the possibility that documented depression may increase as admissions increase. Here we compare rates on the index admission of HUs to rates *on at least one admission*. In every cohort the rate increases. For example, 25% of 18-44 year old females had documented depression on their index admission, compared to 65% on *at least one admission*. Even among the oldest cohort, 24% of females and 35% of males had at least one admission in which depression was documented as a primary or secondary diagnosis.

Table 7. High Utilizers Depression on Index vs. At Least Once Across All Admissions			
		On Index Admission	On at Least One Admission
Females	18-44	25%	65%
	45-64	20%	52%
	65+	11%	35%
Males	18-44	22%	55%
	45-64	14%	41%
	65+	6%	24%

b. Substance Use Disorders

In addition to depression, we looked for the prevalence of substance use disorders (SUD), including alcohol, legal and illegal drug use (but excluding tobacco use). Table 8 demonstrates the extent to which HUs are more likely than others to have documented SUDs. This is especially striking for 18-44 year old HU patients: 20% of females and 37% of males have documented SUDs.

Table 8. Percent with Documented Substance Use Disorders on Index Admission				
		High Utilizers	All Others	Percent by which HUs are Higher
Females	18-44	20%	12%	42%
	45-64	9%	5%	52%
	65+	1%	0.5%	33%
Males	18-44	37%	23%	37%
	45-64	21%	11%	46%
	65+	2%	2%	11%

As with depression, we compare (Table 9) the rates of diagnosed SUD on the index admission to diagnosed SUD *on at least one admission*. More than half of 18-44 year old HUs males had at least one admission in which a SUD was documented. The extraordinarily low rate of SUDs among the oldest cohort raises questions both of underdiagnosis as well as the limitations of this data set to capture the full range of patient comorbidities.

Table 9. High Utilizers SUD on Index vs. At Least Once Across All Admissions			
		On Index Admission	On at Least One Admission
Females	18-44	20%	40%
	45-64	9%	19%
	65+	1%	2%
Males	18-44	37%	54%
	45-64	21%	34%
	65+	2%	5%

IV. Diagnoses

In this final section, we look at some differences in diagnoses between HUs and Other patients, focusing on top diagnoses, common comorbidities, and changes in complexity over multiple admissions.

a. Top Diagnoses for HUs vs. Other Patients

To examine unique and common diagnoses, we chose to use MS-DRG¹⁰ groups, collapsing MS-DRGs which are subdivided by level of severity, into a single category. For example, the three DRGs for COPD (COPD with major complications/comorbidities, COPD with complications/comorbidities, and COPD without complications/comorbidities) were collapsed for our purposes into just COPD. Although DRGs represent very general groupings of diagnoses, the advantage for our purposes here is that there is only one DRG code representing the main reason for admission. As such, we can compare the overarching reasons for a hospitalization among HUs and Others. (While we focus here on the top five most common DRG groups by age and gender for each cohort, for those interested in further detail, Appendix A expands the group to the top 10 DRG groups.)

Table 10 below includes the top five DRG groups in each cohort and shows the percentage of total index admissions in which these five were present. The following observations may be made about the diagnoses unique (among the top five) to the High Utilizers:

- Although “psychoses” is present in both cohorts for those under 65, among the young HU cohorts, behavioral health conditions appear more often. For example, among young HU females, 3 of the top 5 DRG group are behavioral health conditions, compared to 1 of 5 for Others. Among young HU males, 4 of the 5 top DRG groups are behavioral health conditions, compared to 2 of the 5 for Others.
- Alcohol/Drug Abuse/Dependence is unique among the top five DRG groups for 18-44 year old HUs and 45-64 year old males.
- Common chronic diseases – COPD and Heart Failure – are unique among the top 5 DRG groups for middle age HUs. By contrast, these chronic diseases don’t emerge among the top 5 for Other patients until age 65+.

Table 10. Top 5 DRGs by Age and Gender, Index Admission

NOTE: Diagnoses Unique to HUs Are Highlighted in Red

		High Utilizers	Others
18-44	Female	(1) Psychoses; (2) Esphogitis, gastroenteritis/misc. digestive disorders; (3) Depressive neuroses ; (4) Disorders of pancreas except malignancy ; (5) Poisoning and toxic effects of drugs (Total=31%)	(1) Uterine and adnexa procedures for nonmalignancy; (2) Psychoses; (3) O.R. procedures for obesity; (4) Esphogitis, gastroenteritis/misc. digestive disorders; (5) Laparoscopic cholecystectomy (Total = 33%)
	Male	(1) Psychoses; (2) Depressive neuroses; (3) Alcohol/Drug abuse or dependence w/ rehab ; (4) Esphogitis/gastroenteritis/misc. digestive disorders; (5) Poisoning and toxic effects of drugs (Total = 34%)	(1) Psychoses; (2) Depressive neuroses; (3) Cellulitis; (4) Back and neck procedures, except spinal fusion; (5) Esphogitis, gastroenteritis/misc. digestive disorders (Total = 26%)
45-64	Female	(1) COPD ; (2) Psychoses; (3) Esphogitis, gastroenteritis/misc. digestive disorders; (4) Pneumonia ; (5) Heart Failure (Total=22%)	(1) Uterine and adnexa procedures for nonmalignancy; (2) Major joint replacement/reattachment of lower extremity; (3) Psychoses; (4) Esphogitis, gastroenteritis/misc. digestive disorders; (5) O.R. procedures for obesity (Total = 24%)
	Male	(1) Psychoses; (2) COPD ; (3) Heart failure ; (4) Alcohol/Drug abuse or dependence w/ rehab ; (5) Esphogitis, gastroenteritis/misc. digestive disorders (Total = 20%)	(1) Major joint replacement/reattachment of lower extremity; (2) Percutaneous cardiovascular procedure with drug-eluting stent; (3) Back and neck procedures, except spinal fusion; (4) Psychoses; (5) Cardiac Arrhythmia (Total = 20%)
65+	Female	(1)Heart Failure; (2) COPD; (3) Pneumonia; (4) Cardiac Arrhythmia; (5) Kidney and UTIs (Total = 24%)	(1) Major joint replacement/reattachment of lower extremity; (2) Cardiac Arrhythmia; (3) Heart failure; (4) COPD; (5) Pneumonia (Total = 21%)
	Male	(1)Heart failure; (2) COPD; (3) Pneumonia; (4) Intracranial hemorrhage or cerebral infarction ; (5) Cardiac arrhythmia (Total = 24%)	(1) Major joint replacement/reattachment of lower extremity; (2) Heart failure; (3) Pneumonia; (4) Cardiac arrhythmia (5) COPD (Total = 19%)

b. Common Comorbidities

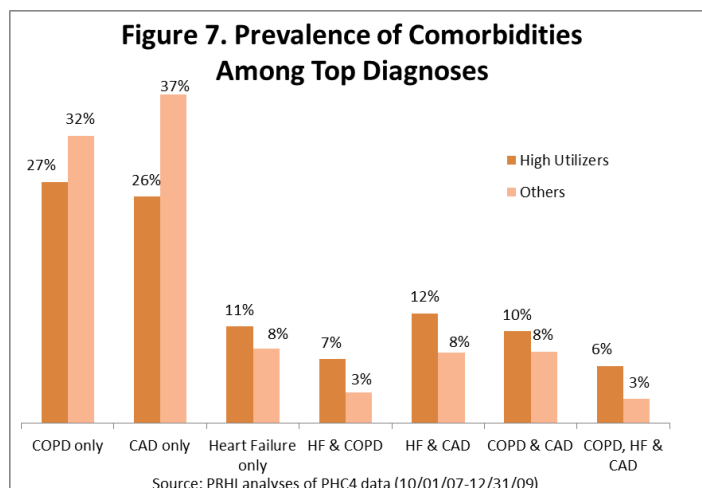
In this section, we look at the relative complexity of HUs vs. Others by examining the prevalence of common chronic diseases as comorbidities in patients with common chronic conditions: heart failure, COPD and cardiac arrhythmia. In particular, we examine the prevalence in both cohorts – first on the index admission, and then on the 5th admission – of the following common comorbid conditions: diabetes, heart failure, essential hypertension, chronic ischemic heart disease, COPD and cardiac arrhythmia. Our findings confirm the complexity of HUs relative to other patients with the same DRG.

Table 11, for example, finds that 40% of HUs hospitalized with Heart Failure (as the DRG) had comorbid diabetes, compared to 32% of Others. This pattern holds for all of the selected comorbidities except essential hypertension. HUs with COPD are more likely than Others with COPD to also have diabetes, heart failure and other chronic ischemic heart disease. Likewise, in addition to diabetes, HUs with heart failure are more likely to also have COPD and chronic ischemic heart disease. That essential hypertension is actually less likely to show up among comorbidities for HUs is probably due the data set's limitations than to the absence of the diagnosis.

Table 11. Prevalence of Common Chronic Disease Comorbidities

ICD-9 Code Group Name (code group number)	Heart Failure (MS-DRG 291-292)		COPD (MS-DRG 190-192)		Cardiac Arrhythmia (MS-DRG 308-310)	
	HUs	All Others	HUs	All Others	HUs	All Others
Diabetes (250)	40%	32%	29%	22%	24%	19%
Heart Failure (428)	*	*	23%	12%	28%	14%
Essential Hypertension (401)	33%	40%	45%	47%	50%	53%
Other Chronic Ischemic Heart Disease (414)	50%	41%	30%	22%	37%	23%
COPD (490-496)	36%	28%	*	*	21%	15%
Cardiac Arrhythmia (427)	44%	43%	19%	14%	*	*

Figure 7 offers another way to look at the issue of relative HU complexity. It compares the extent to which top pulmonary (COPD) and cardiac (coronary artery disease¹¹ [CAD] and heart failure [HF]) diseases, as primary or secondary diagnoses, intersect in the two patient groups. Simple COPD and CAD are both more common among non-high utilizers. The serious diagnosis of heart failure, along with all combinations of COPD, CAD, and HF is more prevalent among high utilizers. Moreover, 35% of HUs have two or more of these three conditions, compared to 22% of others.



c. Increasing Complexity from Index to 5th Admission

Finally, Table 12 repeats Table 11 for just HUs and compares the prevalence of these same common comorbidities on HUs' index and 5th admissions. As such, it suggests increasing complexity over time. By the 5th admission, patients admitted for COPD are much more likely to have heart failure (increase from 23% on index admission to 30%). Those admitted with cardiac arrhythmia are more likely to have diagnosed diabetes (29% vs. 24% on index), heart failure (35% vs. 28% on index) and ischemic heart disease (45% vs. 37% on index).

Table 12. Increasing Complexity of HUs between Index and 5 th Admission						
Comorbidities (ICD-9 code groups)	Heart Failure (MS-DRG 291-292)		COPD (MS-DRG 190-192)		Cardiac Arrhythmia (MS-DRG 308-310)	
	Index	5 th Admit	Index	5 th Admit	Index	5 th Admit
Diabetes (250)	40%	34%	29%	32%	24%	29%
Heart failure (428)	*	*	23%	30%	28%	35%
Essential hypertension (401)	33%	28%	45%	47%	50%	44%
Other chronic ischemic heart disease (414)	50%	49%	30%	32%	37%	45%
COPD (490-496)	36%	38%	*	*	21%	25%
Cardiac Arrhythmia (427)	44%	45%	19%	21%	*	*

V. Key Findings & Implications for Policy and Practice

This observational study has attempted to characterize a group of patients who had at least five hospital admissions over a two year time period. Analyzing all-payer hospital discharge claims data collected by the Pennsylvania Health Care Cost Containment Council, we identified unique demographic, behavioral health, disease severity and diagnostic characteristics of “high utilizers” and compared them to all other patients hospitalized during the same period. Below we summarize the main study findings. We conclude with some observations on their implications for policy and practice.

DEMOGRAPHICS

Gender, Race & Age

- White HUs are more likely than African American HUs to be 65 years of age and older. While 65+ year olds make up 63% of white HUs, they are only 38% of African American HUs.
- As with whites, African American females aged 65+ comprise the largest portion of African American HUs (24%), but to a lesser extent than their white counterparts (36%).
- Beyond the cohort of 65+ females, the most prominent group of African American HUs is males aged 45-64: 40% of African American HUs are 45-64 year olds, compared to 26% of white HUs, reflecting the earlier onset of disease and disability among African Americans.

Socioeconomic Status

- PHC4 data suggest higher and increasing levels of economic vulnerability with increasing admissions among HUs, as represented by the share of patients receiving income-dependent health insurance. Almost a quarter (23%) of HUs were dually-eligible or insured by Medicaid on their index admission compared to 15% of others. Moreover, as admissions increased, so did the share of patients who were dually-eligible – a finding that was especially true for females age 65+.

DISEASE SEVERITY

- **Hospital Length of Stay:** Relative to other patients, HUs length of stay on index admission was 19% to 76% longer, depending on the age and gender group.
- **Hospital Charges:** Overall, average hospital charges were 16% to 18% higher for HUs males and females (respectively) compared to Other males and females, but varied by age and gender group. Youngest HU males were 57% and females 75% higher than others, while there was no difference in average total charges for those 65+.
- **Discharge Status:** HUs were more likely than Others to be discharged home with home health care in nearly every age and gender group (except for males 45-64 years old). Among HUs, females were more likely than males in the same age group to be discharged home with home health care. In addition to the fact that women are more likely to outlive their husbands, another explanation for this pattern may be that men, more than women, can rely on family caregivers for post-discharge support.

BEHAVIORAL HEALTH COMORBIDITIES

- There were much high rates of documented depression & substance use disorders (SUDs) among HU patients relative to other patients.
- Depression rates among HUs were between 16% higher (65+ year old females) and 55% higher (18-44 year old males) than that of their non-HU counterparts. Most vulnerable were 18-44 year old HUs of both genders which had documented depression in more than one out of five patients.
- While SUDs were prevalent in less than 5% of patients aged 65 years old and older in both the HU and Other groups, in the younger groups, SUDs among HUs ranged between 12% higher (65+ males) to more than double (45-64 females) that of other counterparts. Most vulnerable were 18-44 year old HU males, 37% of whom had documented SUDs.
- Documented depression was more likely over multiple admissions. The percent of HUs with comorbid depression *on at least one admission* more than doubled relative to the index admission for every age and gender group.

DIAGNOSES

Top Diagnoses

- Although “psychoses” is present in both cohorts for those under 65, among the young HU cohorts, behavioral health conditions appear more often among the top 5 diagnoses for HUs.
- Alcohol/Drug Abuse/Dependence is unique among the top five DRG groups for HU males 18-44 years old and 45-64 years old.
- Common chronic diseases – COPD and Heart Failure – are unique among the top 5 DRG groups for middle age HUs (45-64). By contrast, these chronic diseases don’t emerge among the top 5 for Other patients until age 65+.

Common Comorbidities

- Focusing on three of the shared top DRGs in both groups (heart failure, COPD, and cardiac arrhythmia), we showed that common, complicating chronic disease comorbidities, such as diabetes, heart failure, COPD, and ischemic heart disease, were all more prevalent among HUs than other patients.

Increasing Complexity between the Index and 5th Admission

- The likelihood of documented common chronic disease comorbidities for HU patients with one of three high volume chronic diseases (heart failure, COPD or cardiac arrhythmia) increased between the index and 5th admission.

Potential implications for healthcare policy and practice raised by some of the more noteworthy findings are summarized in Table 13 below.

Table 13.	
Finding	Implications for Practice and Policy
High utilizers aren’t all older whites.	Culturally appropriate care
Male HUs are less likely than female HUs to be discharged with home health care.	Support for caregivers
There are extraordinary rates of comorbid behavioral health conditions at every age among HUs.	Behavioral health integration
Common chronic diseases (e.g., heart failure and COPD) appear at younger ages among HUs. For those 65+, the same chronic diseases appear among the top DRG groups both groups, but at higher rates among HUs.	High intensity primary care Care transition support Community partnerships
High and increasing economic vulnerability over multiple admissions, especially for older women.	
High prevalence of complicating comorbidities among HUs.	Guidelines that address complex comorbidities
	Careful tracking of readmission reduction initiatives

Appendix A

Appendix Table A. High Utilizer Top 10 Most Common Diagnosis Groups on Index Admission	
Grouped MS-DRGs	Percent of Admits
Heart Failure and Shock (291-293)	6%
Chronic Obstructive Pulmonary Disease (190-192)	5%
Psychoses (885)	5%
Simple Pneumonia and Pleurisy (193-195)	3%
Esophagitis, Gastroenteritis and Miscellaneous Digestive Disorders (391-392)	3%
Cardiac Arrhythmia and Conduction Disorders (308-310)	2%
Septicemia or Severe Sepsis (870-872)	2%
Renal Failure (682-684)	2%
Intracranial Hemorrhage or Cerebral Infarction (064-066)	2%
Cellulitis (602-603)	2%
Total top ten MS-DRGs (grouped)	32%

Appendix Table B. Non-High Utilizer Top 10 Most Common Diagnosis Groups on Index Admission	
Grouped MS-DRGs	Percent of Admits
Major Joint Replacement or Reattachment of Lower Extremity (469-470)	5%
Psychoses (885)	4%
Esophagitis, Gastroenteritis and Miscellaneous Digestive Disorders (391-392)	3%
Uterine and Adnexa Procedures for Nonmalignancy (742-743)	3%
Simple Pneumonia and Pleurisy (193-195)	3%
Cardiac Arrhythmia and Conduction Disorders (308-310)	2%
Back and Neck Procedures Except Spinal Fusion (490-491)	2%
Chronic Obstructive Pulmonary Disease (190-192)	2%
Percutaneous Cardiovascular Procedure with Drug-Eluting Stent (246-247)	2%
Heart Failure and Shock (291-293)	2%
Total top ten MS-DRGs (grouped)	28%

Note: Six of the 10 DRG groups are common to both groups; these are highlighted in red. These six represent 24% of HU index admissions, but just 16% of non-HUs index admissions, suggesting that health conditions cluster across fewer diagnoses for HUs than for other patients.

¹ Cohen S and Yu W, The concentration and persistence in the level of health expenditures over time: Estimates for the U.S. population, 2008-2009, *MEPS Statistical Brief* No. 354, 2012.

² Gawande, Atul . THE HOT SPOTTERS, Can we lower medical costs by giving the neediest patients better care? *The New Yorker*. January 2011. Retrieved from http://www.newyorker.com/reporting/2011/01/24/110124fa_fact_gawande, April 30, 2014.

³ PHC4 is an independent state agency created and mandated in 1986 by the Pennsylvania (PA) legislature to collect, analyze and make available public data on the cost and quality of care in Pennsylvania. All PA hospitals must report discharge data to PHC4 within 90 days. For more information, see www.phc4.org.

⁴ Note: Patients with any admission for childbirth were excluded from both the high utilizer (279 patients) and the benchmark groups (56,251 patients).

⁵ For example, Smits et al (2009) identified the top 10% of utilizers over a 1-year period as high utilizers (Smits, ThM, Brouwer HJ, Riet Gt and van Weert HCP. Epidemiology of frequent attenders: a 3-year historic cohort study comparing attendance, morbidity and prescriptions of one-year and persistent frequent attenders. *BMC Public Health* 2009;9(6). <http://www.biomedcentral.com/1471-2458/9/36>

⁶ Total hospital charges include room & board, ancillary, drug, equipment, specialty, and miscellaneous charges. Professional fees are not included in total hospital charges.

⁷ Depression included ICD-9 codes 296.20 – 296.36, 298.0, 300.4, 309.1, and 311. SUDs included related to alcohol, legal & illegal drug use (ICD-9 codes 303, 304 or 305), but excluding tobacco use.

⁸ http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5938a2.htm?s_cid=mm5938a2_e%0d%0a, accessed November 21, 2013.

⁹ Strine TW, Mokdad AH, Balluz LS, et al. Depression and anxiety in the United States: findings from the 2006 Behavioral Risk Factor Surveillance System. *Psychiatr Serv* 2008;59:1383—90, cited in http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5938a2.htm?s_cid=mm5938a2_e%0d%0a.

¹⁰ Diagnosis-related group (DRG) is a system to classify hospital cases into groups. They have been used in the United States since 1983. The MS-DRG groups are used by Medicare to guide its payments to hospitals.” For more information, see <http://health-information.advanceweb.com/Web-Extras/CCS-Prep/An-Inpatient-Prospective-Payment-System-Refresher-MS-DRGs-2.aspx> (from Advance Healthcare Network) and <http://www.findacode.com/drg/drg-diagnosis-related-group-codes.html> (from Find-A-Code), accessed November 21, 2013.

¹¹ ICD-9 code groups include 410 (acute myocardial infarction), 411 (other acute and subacute forms of ischemic heart disease), 412 (old myocardial infarction), 413 (angina pectoris), and 414 (other forms of chronic ischemic heart disease).