

PRHI Readmission Brief

Brief II: Patterns of Hospital Admission and Readmission Among HIV-Positive Patients in Southwestern Pennsylvania

I. INTRODUCTION



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Human immunodeficiency virus (HIV) – the cause of acquired immunodeficiency syndrome (AIDS) – is an incurable condition in which the immune system begins to fail, exposing the infected individual to opportunistic infections and malignancies that are life-threatening. Considered a pandemic by the World Health Organization, AIDS has killed more than 23 million people worldwide.¹ When the disease was first discovered, death rates were very high: although it may take 10-15 years for an HIV infection to transition to AIDS, life expectancy following the development of AIDS was typically a year. With the discovery of effective medications, however, life expectancy at HIV diagnosis increased from 10.5 years to 22.5 years between 1996 and 2005.² As a result, providers who work with patients with HIV/AIDS now share many of the management challenges common to providers of older patients with chronic diseases more generally: balancing treatments for multiple co-morbidities, responding to changing treatment options, successfully engaging patients in self care, and preventing repeated hospital admissions.

The Jewish Healthcare Foundation's (JHF) commitment to the community struggling with HIV dates back to 1992-93, when JHF became the fiscal agent for the Ryan White Comprehensive AIDS Resources Emergency (CARE) Act in Southwestern Pennsylvania (SWPA). As a result, the Foundation responded to the opportunity, made possible by the rich Pennsylvania Health Care Cost Containment Council (PHC4)³ all-insurer, hospital admissions database, and requested that Pittsburgh Regional Health Initiative (PRHI) analyze characteristics of hospitalizations among the 562 HIV-positive patients over the age of 18 who were admitted a total of 1,072 times to hospitals in an 11-county SWPA region⁴ between October 1, 2007 and September 30, 2008. To put this number in perspective, approximately 900 people receive medical care from two regional HIV/AIDS hospitals and clinics.

The goal of this monograph is to provide information about HIV-positive patients and their patterns of hospital admission and readmission and to inform the network of clinical and community providers serving the HIV-community. The eventual aim of this research is to help these providers to continually improve patient care. The analyses focus on the following:

1. Characteristics of HIV-positive patients
2. Characteristics of hospital admissions among HIV-positive patients
3. Patterns of admission and readmission
4. Opportunities for reducing readmissions

A Word about Definitions

Profiling HIV-positive patients by discharge codes is problematic. Standards from The [International Statistical Classification of Diseases and Related Health Problems](#) coding system, 9th edition, (also known as ICD-9) dictate that a minimum of two codes be used for each HIV admission – the ICD-9 code for HIV (042, or v08 if the HIV is asymptomatic), and the code for the disease process or symptom causing the admission. (Until recently, HIV infection itself was felt not to be the cause of significant morbidity. Its direct pathology only became as evident as

widespread antimicrobial prophylactic strategies sharply reduced the burden of opportunistic infections, raising the importance of less-prevalent direct complications like HIV neuropathy. Unless a problem prompting admission was convincingly unrelated to HIV, the principal diagnosis should be listed as “HIV”. This coding nuance rendered the ICD-9 code for the primary diagnosis too often unrevealing when trying to study population-based admission trends. Diagnosis Related Groups (DRGs) – the unified billing codes calculated through CMS grouper logic software and based on entered ICD-9 diagnoses codes and procedures – was similarly hindered by the need to highlight “HIV” in the diagnosis group label. To identify underlying risk factors for admission and readmission, we consequently chose to evaluate the full range of primary and secondary diagnoses for each admission involving an HIV-positive patient.

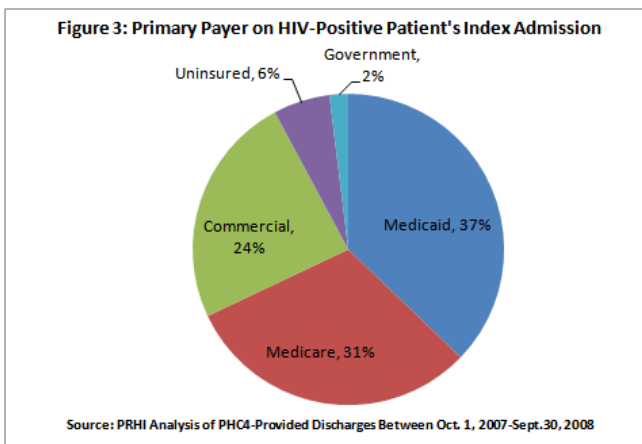
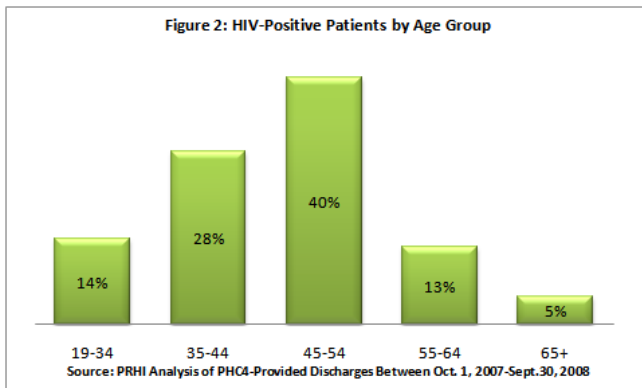
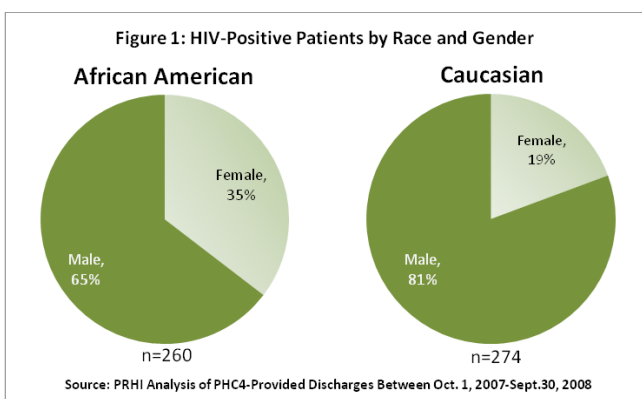
II. CHARACTERISTICS OF HIV-POSITIVE PATIENTS

Before turning to the 1,072 admissions of HIV-positive patients, we look in this section at characteristics of the 562 patients themselves. Although the incidence of HIV among African Americans in the U.S. is significantly higher than among Caucasians,⁵ Figure 1 shows that hospitalized patients in SWPA were almost equally likely to be African American as Caucasian.

Males predominate in both groups, but HIV-positive Caucasians were more likely to be male (81%) than were African Americans (65% male), and African Americans were more likely to be female (35%) than were Caucasians (19%).

Consistent with increased longevity of HIV-positive patients, Figure 2 indicates that, while just over 40% of HIV-positive patients are less than 45 years of age, nearly the same proportion are between 45 and 54 years of age, 18% are actually 55 or older, 5% of whom are 65 or older.

Finally, Figure 3 shows a summary of the primary insurer for the initial – or *index* – admission in the timeframe. Only a quarter of HIV-positive patients have commercial insurance, a marker for probable economic vulnerability. Medicaid or Medicare is the primary payer for 68% of all patients’ index admissions.⁶



III. CHARACTERISTICS OF HOSPITAL ADMISSIONS AMONG HIV-POSITIVE PATIENTS

This section attempts to sort through the complexity of reasons that HIV-positive patients are hospitalized. We examine which diagnoses were most prevalent in hospitalizations of HIV-positive patients. In a broader look at secondary diagnoses (or co-morbidities), we also examine the prevalence of behavioral health conditions, such as depression and substance use disorders (SUD). The picture that emerges is one of extraordinarily complex patients – with conditions ranging from HIV-related infections, to common chronic diseases, to the side effects of mental illness, drug abuse, chronic diseases, and to the medications used to treat HIV itself.

Most Prevalent non-HIV Diagnoses

For each hospitalization, a diagnostic code is provided for the principal reason the patient was hospitalized, and up to eight codes are provided that detail the other conditions, or secondary diagnoses present on that admission. Since every patient in our dataset is HIV-positive, an HIV code of 042 or v08 will be present on every admission – whether as principal or secondary diagnoses. Here we explore the non-HIV principal and secondary diagnoses that are most prevalent on admissions of HIV-positive patients. Table 1 summarizes the 10 most common conditions among the 8,029 principal and secondary diagnoses present on the 1,072 admissions in our data. It is important to note that a patient, on any given admission, may have one or more of the conditions listed in Table 1.

Table 1: Most Prevalent (non-HIV) Diagnoses of HIV-Positive Patients

Most Prevalent Principal or Secondary Diagnoses (by ICD-9 code groups)	Number of Admissions	Percent of Admissions
1. Nondependent abuse of drugs	304	28%
2. Viral hepatitis	254	24%
3. Disorders of fluid electrolyte and acid-base balance	233	22%
4. Essential hypertension	206	19%
5. Diseases of esophagus	134	13%
6. Depressive disorder not elsewhere classified	134	13%
7. Diabetes mellitus	131	12%
8. Drug dependence	125	12%
9. Chronic renal failure	122	11%
10. Affective psychoses	116	11%

The most common ICD-9 code groups include *Nondependent Abuse of Drugs* (present on 28% of admissions) – a category that applies to a broad range of situations, from misuse of habit-forming medications, to tobacco and alcohol abuse. Consistent with the fact that approximately 30% of HIV-infected patients in the United States are co-infected with the *Hepatitis C* virus and about 8% are co-infected with *Hepatitis B*,^{7,8} *Viral Hepatitis* was present on 24% of admissions of HIV-positive patients in SWPA.

Disorders of Fluid Electrolyte and Acid-Base Balance (22%), is often related to clinical dehydration. Nausea and vomiting are common presenting symptoms in HIV-positive patients, and may be a marker of intolerance to HIV medications,⁹ among other reasons. Implications for improved care aimed at preventing hospital admissions are discussed in the concluding section of this monograph.

Finally, we note the prevalence of several chronic diseases among the top ten, including *Essential Hypertension (19%)*, *Diabetes mellitus (12%)*, and *Chronic renal failure (11%)*. While the older age of HIV-positive patients may be associated with increased risk of these chronic conditions, HIV infection has been shown to increase the risk of non-AIDS-related cardiovascular disease, renal disease, liver disease, and malignancies.¹⁰ Further, renal failure can be related to HIV nephropathy, or side effect from medication. Similarly, *Diabetes* in HIV patients may be a long-term side effect of certain AIDS medications, especially protease inhibitors.¹¹

Behavioral Health Co-morbidities

As seen in Table 1, mental health diagnoses and substance use disorders (SUD) make up four of the top 10 most prevalent non-HIV diagnoses. In this section, we widen our examination of behavioral health co-morbidities among the six non-behavioral health diagnoses. Table 2 provides the percentage of admissions in which the patient had co-morbid depression and/or SUD¹² for the six most prevalent non-behavioral health diagnoses, and shows that between 14% and 55% of admissions involved patients with co-morbid depression and/or SUD. Among all admissions, 22% involved patients with co-morbid depression, and almost half involved patients with either co-morbid depression and/or a substance use disorder.

Table 2: Behavioral Health Co-morbidities, by Most Prevalent Primary Reasons for Hospitalization

Most Prevalent non-Behavioral Health Principal or Secondary Diagnoses (ICD-9 code groups)	Percent of Admissions with Comorbid Depression	Percent of Admissions with Comorbid SUD	Percent of Admissions with Comorbid Depression or SUD
2. Viral hepatitis	23%	46%	55%
3. Disorders of fluid electrolyte and acid-base balance	14%	33%	42%
4. Essential hypertension	26%	37%	49%
5. Diseases of esophagus	33%	31%	49%
7. Diabetes mellitus	18%	32%	40%
9. Chronic renal failure	14%	24%	36%
All 1,072 HIV-Positive Admissions	22%	38%	47%

Documentation of suicidal thoughts or attempts in 19% of admissions for *Affective psychoses* and *Depressive disorders* is a clear signal of the medical and emotional vulnerability of HIV-positive patients. Overall, however, suicidal thoughts or attempts were documented on only 3% of admissions – much lower than is found in the literature on HIV clinic patients.^{xiii} This may be due to underreporting, or to the fact that only up to eight secondary diagnoses are coded for each admission. By looking at this listing of only the top 10 diagnosis codes, compelling trends emerge that we analyze below.

IV. PATTERNS OF HOSPITAL ADMISSIONS AND READMISSIONS

This section considers patterns of hospital admissions and readmissions for HIV-positive patients with the diagnoses described above. It examines total number of admissions and readmissions within the 12-month study period, rates of 30-day readmissions (overall and by race, gender, hospital and insurer), and average number of days between admissions. It also compares length of stay (LOS) and total hospital charges on the index admission to that on 30-day readmissions.

Average Number of Admissions

The majority of HIV-patients (62%) were admitted just once during the 12-month timeframe, although the average patient had approximately two admissions. Slightly more than a fifth of the patients were admitted more than three times and four patients had 10 or more admissions during the 12-month timeframe.

Table 3: Admissions for HIV-positive Patients

Number of Admissions in 12 months	Percent of Patients
1	62%
2	18%
3	9%
4	4%
5+	8%

Readmissions Rates

As shown in Table 4, 25% of all admissions of HIV-positive patients were followed within 30 days by another admission. This rate varies by diagnosis on the index admission and ranges from 20% (*Depressive disorder*) to 39% (*Chronic renal failure*). Within the study period, on average, 48% of admissions were followed by at least one additional admission within 12 months, ranging from 46% (following admissions for *Nondependent abuse of drugs* and *Essential Hypertension*) to 69% (following admissions for *Drug dependence* or *Chronic renal failure*).

Table 4: Readmission Rates, by most prevalent Principal or Secondary Diagnoses

Most Prevalent Principal or Secondary Diagnoses (ICD-9 code groups)	30-Day Readmission Rate	Readmissions within the 12-Month Study Period ¹⁴
1. Nondependent abuse of drugs	22%	46%
2. Viral hepatitis	32%	56%
3. Disorders of fluid electrolyte and acid-base balance	29%	53%
4. Essential hypertension	23%	46%
5. Diseases of esophagus	35%	53%
6. Depressive disorder not elsewhere classified	20%	50%
7. Diabetes mellitus	33%	63%
8. Drug dependence	33%	69%
9. Chronic renal failure	39%	69%
10. Affective psychoses	29%	52%
All 1,072 HIV-Positive Admissions	25%	48%

Readmissions by Race and Gender

Section II of this monograph showed the distribution by race among the 562 patients with HIV in our sample. In this section, we look at the distribution by race across the 1,072 admissions of HIV-positive patients. As indicated in Table 5, 25% of all admissions were followed within 30 days by a readmission. Lowest 30-day readmission rates were for admissions of Caucasian men (23%); highest rates were for admissions of Caucasian women (34%). Caucasian women have the highest 30-day

Table 5: Readmission Rates by Race and Gender

Demographic Group	Overall Admissions	30-Day Readmit Rate
Female	304	28%
African American	173	25%
Caucasian	122	34%
Male	768	24%
African American	372	27%
Caucasian	368	23%
Overall (all races)	1072	25%
African American	545	26%
Caucasian	490	26%

readmission rates, although their rates are only significantly higher than that of Caucasian men (34% vs. 23%; p=0.016).

Readmissions by Hospital

Table 6 shows the number and share of admissions, the 30-day readmission rates, and overall readmissions within the 12-month study period among the ten hospitals that admit most HIV-positive patients in Southwestern Pennsylvania. Both UPMC Presbyterian Shadyside and Allegheny General Hospital have affiliated HIV clinics, so their large share of admissions is not surprising.

While the average 30-day readmission rate across all 1,072 admissions is 25%, among these top ten facilities, the rate varies from 13% at UPMC McKeesport to 50% at Heritage Valley Beaver. While no attempt has been made in this overview to risk-adjust these rates, exploring possible reasons for this variation across hospitals may provide useful insights into best practice care.

Table 6: Admissions and Readmissions among the Ten Hospitals Admitting Most HIV-positive Patients

Facility Name	Number of Admissions	Share of All Admissions	30-Day Readmission Rate	Readmissions within the 12-Month Study Period
UPMC Presbyterian Shadyside	432	40%	29%	53%
Allegheny General Hospital	135	13%	20%	40%
UPMC Mercy	70	7%	38%	53%
Western Pennsylvania Hospital	56	5%	26%	51%
Western Psychiatric Institute & Clinic	50	5%	24%	56%
UPMC McKeesport	48	4%	13%	42%
Heritage Valley Beaver	29	3%	50%	64%
UPMC Braddock	27	3%	22%	37%
Jefferson Regional Medical Center	22	2%	14%	38%
UPMC St. Margaret	21	2%	38%	62%
All 1,072 HIV-Positive Admissions	1,072	100%	25%	48%

Readmissions by Insurer

Finally, we look at readmission rates by insurer. Figure 3 (in Section II) showed the primary insurer for our sample's 562 patients on the index admission. Since a patient may change insurers over multiple admissions, Table 7 looks at the distribution of insurers across all of the 1,072 admissions.

Medicaid and Medicare 30-day readmission rates are 28% and 31%, respectively.

Readmission rates for admissions in which the patient had commercial insurance (16%) or was uninsured (4%) are substantially lower. It may be that the lower commercial insurance 30-day readmission rate is a reflection of the relative health of HIV-patients still well enough to be working and qualifying for employer-purchased health insurance. The very low uninsured readmission rate is more worrisome and may indicate a possible barrier to care. In part, this may represent the movement of patients in obvious need of health

Table 7: Readmissions by Primary Payer

Primary Insurer Type	Number of Admissions	Share of All Admissions	30-Day Readmission Rate
Medicaid	424	40%	28%
Medicare	365	34%	31%
Commercial	225	21%	16%
Uninsured	40	4%	8%
Government	18	2%	12%

insurance out of the “uninsured” category. It is important to confirm that the low readmission rate among the uninsured is not signaling a barrier to needed inpatient care.

Hospital Length of Stay and Total Charges

Table 8 provides an overview of average length of stay (LOS) and average total hospital charges¹⁵ for admissions of HIV-positive patients, by the most common diagnoses on the *index admission*, providing some perspective on the advantages to both patients and insurers associated with reducing admissions and readmissions. Over all 1,072 admissions for HIV-positive patients, LOS was 6.4 days on the index admission and slightly lower (5%) on readmissions within 30 days. Exceptions were for admissions in which diagnoses included *Diseases of the esophagus*, *Diabetes*, and *Chronic renal failure*, where readmission LOS was longer. However, overall total average hospital charges were 32% higher on the readmission relative to the index admission, with *Diseases of the esophagus* (at 90% higher), *Disorders of fluid electrolyte and acid-base balance*, and *Nondependent abuse of drugs* all higher even than 32%.

Table 8: Length of Stay and Total Charges on Readmission Compared to Index Admission

Most Prevalent Principal or Secondary Diagnoses on the Index Admission (ICD-9 code groups)	Average LOS on Index	LOS on Readmit Compared to Index	Average Total Charge on Index	Total Charge on Readmit Compared to Index
1. Nondependent abuse of drugs	5.6	7% lower	\$31,545	43% higher
2. Viral hepatitis	6.4	5% lower	\$86,792	31% higher
3. Disorders of fluid electrolyte and acid-base balance	7.5	12% lower	\$78,183	40% higher
4. Essential hypertension	5.2	15% lower	\$36,401	20% lower
5. Diseases of esophagus	4.8	13% higher	\$33,565	90% higher
6. Depressive disorder not elsewhere classified	5.2	12% lower	\$28,409	4% lower
7. Diabetes mellitus	5.2	8% higher	\$40,352	18% higher
8. Drug dependence	7.4	31% lower	\$33,415	17% lower
9. Chronic renal failure	7.1	9% higher	\$62,367	1% higher
10. Affective psychoses	6.2	31% lower	\$28,019	21% lower
All 1,072 HIV-Positive Admissions	6.4	5% lower	\$59,123	32% higher

V. OPPORTUNITIES FOR REDUCING ADMISSIONS

This final section considers information that may help clinicians and community providers to identify patients at high risk for readmission and to arrange additional support. It specifically looks at diagnoses that are associated with significantly higher 30-day readmission rates and examines the time frame following hospital discharge during which most readmissions occur. Finally, we report possible limitations on provider ability to manage and coordinate patient care, including the extent to which patients are readmitted to a different facility from which they were discharged and the prevalence of patients not complying with medical treatment or leaving the hospital against medical advice.

Flags for 30-day Readmissions

Overall, 25% of admissions for HIV-positive patients resulted in a readmission within 30 days; moreover, just under half of all admissions were followed by another admission within the 12-month study period. To explore possible flags for probable 30-day readmissions, Table 9 compares the 30-day readmission

rates for patients with one of the most prevalent primary or secondary diagnoses to 30-day readmission rates when these conditions are not present. Admissions in which the patient had primary or secondary diagnoses of the following conditions were significantly more likely to be followed within 30 days by a readmission: *Chronic renal failure, Diseases of the esophagus, Viral hepatitis, Diabetes, and Drug dependence.*

Table 9: Readmission Rates in the Presence of Key Diagnoses

Most Prevalent Primary or Secondary Diagnoses (ICD-9 code groups)	30-day readmit rate when condition present	30-day readmit rates when condition <i>not</i> present	Difference in 30-day readmit rates
1. Nondependent abuse of drugs	22%	27%	Not significant
2. Viral hepatitis	32%	23%	Significantly higher (p=0.010)
3. Disorders of fluid electrolyte and acid-base balance	29%	24%	Not significant
4. Essential hypertension	23%	26%	Not significant
5. Diseases of esophagus	35%	24%	Significantly higher (p=0.006)
6. Depressive disorder not elsewhere classified	20%	26%	Not significant
7. Diabetes mellitus	33%	24%	Significantly higher (p=0.032)
8. Drug dependence	33%	24%	Significantly higher (p=0.038)
9. Chronic renal failure	39%	24%	Significantly higher (p<0.000)
10. Affective psychoses	29%	25%	Not significant

Days to Next Admission

Table 10 shows the average number of days to readmission when the readmission occurs within 30 days of discharge and when the readmission occurs sometime within the 12-month study period. Among 30-day readmissions, patients return to the hospital, on average, within just 11.9 days. When an admission is followed by a readmission within the 12-month study period, the average patient returns within 52 days. The window of opportunity for preventing a 30-day readmission, therefore, occurs within the first two weeks post-discharge, and the window for preventing readmissions over a 12-month timeframe occurs within the first two months following discharge.

Table 10: Days to Next Admission

Most Prevalent Principal or Secondary Diagnoses (ICD-9 code groups)	Number of Admissions	Average Days to 30-day Readmission	Average Days to 12-Month Readmission
1. Nondependent abuse of drugs	304	11.6	55.7
2. Viral hepatitis	254	13.4	53.1
3. Disorders of fluid electrolyte and acid-base balance	233	10.5	42.6
4. Essential hypertension	206	12.0	50.3
5. Diseases of esophagus	134	12.7	52.8
6. Depressive disorder not elsewhere classified	134	10.9	62.2
7. Diabetes mellitus	131	12.1	53.5
8. Drug dependence	125	12.8	55.8
9. Chronic renal failure	122	9.3	47.3
10. Affective psychoses	116	11.5	51.6
All 1,072 HIV-Positive Admissions	1,072	11.9	52.2

Limitations on Provider Ability to Influence Patient Outcomes

While working rapidly to prevent readmissions is likely to require effective in-hospital flagging of patients most likely to be readmitted, better discharge planning and coordination across transitions of care, and productive provider-patient communication. This analysis notes some barriers to effective readmission reduction efforts. For example, in more than 30% of admissions that are followed within 30 days by a readmission, patients are admitted to a different hospital than the one from which they were discharged. This means not only that the patient is likely to interact with a new set of clinicians, but that, without portable electronic health records, there are likely to be challenges in terms of care continuity and care coordination.

Patient choices may also limit the ability of providers to influence patient outcomes. For example, some 5% of admissions document “personal history of noncompliance with medical treatment presenting hazards to health.” In a similar vein, Table 11 shows that in 3% of admissions patients “left against medical advice.” Both may be seen as markers either for patients who are unable or unwilling to comply with a treatment regimen, and/or as a signal for poor patient-provider communication.

Table 11: Kinds of Discharges – Prevalence and Associated Readmission Rates

Kind of Discharge	Number of Admissions	Share of Admissions	30-Day Readmission Rate
Discharged to Home	770	72%	26%
Discharged to Home with Home Health Service in Anticipation of Covered Skilled Care	93	9%	26%
Discharged/Transferred for Further Hospitalization at Short Term, Rehab, Long-Term, Critical Care Facilities	66	6%	14%
Discharged/Transferred to Skilled Nursing or Intermediate Care Facility	65	6%	35%
Discharged/Transferred to a Psychiatric Hospital or Psychiatric Unit of a Hospital	8	1%	13%
Patient Died	30	3%	–
Left Against Medical Advice	32	3%	34%
Hospice	6	1%	0%
Discharged/Transferred to Another Type of Institution Not Elsewhere Defined in this List	2	0%	0%

VI. KEY FINDINGS AND POSSIBLE IMPLICATIONS

This monograph draws on hospital discharge data collected by the Pittsburgh Regional Health Initiative to provide a picture of HIV-positive patients and their patterns of hospital admission and readmission. The goal is to inform the network of clinical and community providers serving the HIV-community, as they seek to continually improve their care. The report’s key findings along with their possible implications are outlined below.

Characteristics of HIV-positive patients

- Approximately 40% of patients are under 45 years of age, 18% are 55 or older and 5% are 65 or older.
 - **Implications:** The age profile of patients extends across the age spectrum, with implications not only for needed clinical support, but perhaps especially for needed social and community support.

- Only a quarter of patients had commercial insurance; Medicaid or Medicare was the primary payer for 74% of admissions and 30-day readmission rates were highest in those groups.
 - **Implications:** Both Medicaid and Medicare (when provided to patients under the age of 65) are markers not only for health vulnerability, but also for economic vulnerability.
- There is no difference in 30-day readmission rates between African Americans and Caucasians, and hospitalized patients were almost equally likely to be African American as Caucasian.
 - **Implications:** Given that 30-day readmissions may be a signal for quality of care, it is good news that there are no obvious racial disparities related to readmissions. On the other hand, if SWPA is like the rest of the nation, there are more African Americans than Caucasians with HIV. Additional information would be required to confirm whether this distribution of admissions reflects the distribution of HIV patients in SWPA, whether African Americans with HIV are less likely to be hospitalized than Caucasians.

Characteristics of hospital admissions

- The most common diagnoses across all admissions were *Nondependent Abuse of Drugs* (present on 28% of admissions), *Viral Hepatitis* (24% of admissions), and *Disorders of Fluid Electrolyte and Acid-Base Balance* (22%). In addition, several chronic diseases are also among the most prevalent diagnoses (including *Hypertension*, *Diabetes* and *Chronic renal failure*).
 - **Implications:** Admissions for *Disorders of fluid electrolyte and acid-base balance* are associated with dehydration and possibly with malnourishment. The condition may result as a reaction to HIV treatment or from illness. It is a concern that individuals in this community may not have the social supports that would enable them to count on simple food assistance in times of illness.
- Behavioral health diagnoses (mental health and substance use disorders) make up of four of the top 10 most prevalent non-HIV diagnoses. Across all admissions, 22% were for patients with co-morbid depression; almost half were for patients with either co-morbid depression and/or SUD.
 - **Implications:** Along with Viral Hepatitis, all are markers for high risk behaviors. Further, clinical management of HIV patients with behavioral health problems may be especially challenging. Psychological symptoms may be manifestations of common depression or anxiety, but may also be HIV-related neurocognitive dysfunction. Regularly screening for behavioral health comorbidities may improve overall management of HIV.

Patterns of admission and readmission

- A high, 25% of all admissions were followed within 30 days by another admission – a rate that ranges from 20% (*Depressive disorder*) to 39% (*Chronic renal failure*) among the most prevalent non-HIV diagnoses. Further, about half of admissions were followed by at least one additional admission within 12 months, ranging from 46% (following admissions for *Nondependent abuse of drugs* and *Essential Hypertension*) to 69% (following admissions for *Drug dependence* or *Chronic renal failure*).
 - **Implications:** PRHI analysis of all-condition SWPA hospitalizations shows a 16% 30-day readmission rate, nearly 10% lower than the 30-day readmission rate for HIV-positive patients. Though HIV-positive patients have a complex disease that would explain higher readmission rates, there is still an opportunity for targeting readmission reduction.

- The average 30-day readmission rate for admissions of patients with commercial insurance (at 16%) was about half that of Medicare (31%) and Medicaid (28%). The readmission rate for uninsured was just 4%.
 - **Implications:** Lower commercial insurance readmission rates may be a reflection of the relative health of HIV patients still well enough to be working and qualifying for employer-purchased health insurance. The very low uninsured readmission rate is more worrisome, indicating a possible barrier to care. It may be that uninsured patients in obvious need are moved rapidly to other insurance. The time from application to receipt of Medicaid, for qualifying individuals, is approximately 30-45 days. However, the waiting period to qualify for Medicare, for those under age 65 *after* permanent disability has been established, is 24 months – a period during which it may be reasonably assumed that some patients do not have insurance.

Opportunities for reducing readmissions

- Admissions in which the patient had primary and/or secondary diagnoses in the following the ICD-9 code groups were significantly more likely to be followed within 30 days by a readmission: *Chronic renal failure, Diseases of the esophagus, Viral hepatitis, Diabetes, and Drug dependence*.
 - **Implications:** The presence of these diagnoses appears to “flag” probable readmissions. This information may usefully trigger added support among inpatient, outpatient and community care providers.
- Among 30-day readmissions, patients return to the hospital, on average, within just 11.9 days. For an admission followed by a readmission within the 12-month study period, the average patient returns within 52 days.
 - **Implications:** This finding suggests that the window of opportunity for preventing a 30-day readmission occurs within the first two weeks post-discharge, and the window for preventing readmissions over a 12-month timeframe occurs within the first two months post-discharge. It appears that reducing readmissions will require rapid deployment of clinical and community support in planning for discharge and post-discharge follow-up.
- In more than 30% of admissions that are followed within 30 days by a readmission, patients are admitted to a different hospital than the one from which they were discharged.
 - **Implications:** This pattern presents real challenges in terms of care continuity and care coordination. A better understanding of patient admissions over time may help to identify the reasons why patients are moving among hospitals.
- In 5% of all admissions, a code for “personal history of noncompliance with medical treatment presenting hazards to health” is recorded. In a similar vein, in 3% of admissions patients “left against medical advice” (a code that was associated with higher 30-day readmissions).
 - **Implications:** While both suggest that there may be limits to the ability of providers to influence patient outcomes, both may also signal the need for improved patient-provider communication.

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- ¹ Joint United Nations Programme on HIV/AIDS, Overview of the Global AIDS Epidemic, 2006 Report on the global AIDS epidemic, 2006, http://data.unaids.org/pub/GlobalReport/2006/2006_GR_CH02_en.pdf, Accessed October 13, 2009.
- ² Harrison, K M; Song, R; Zhang, X, "Life Expectancy after HIV Diagnosis Based on National HIV Surveillance Data from 25 States, United States," *Journal of Acquired Immune Deficiency Syndrome*, 02 September 2009, http://journals.lww.com/jaids/Abstract/publishahead/Life_Expectancy_After_HIV_Diagnosis_Based_on.99172.aspx, Accessed October 13, 2009.
- ³ The Pennsylvania Health Care Cost Containment Council (PHC4) is an independent state agency responsible for addressing the problem of escalating health costs, ensuring the quality of health care, and increasing access to health care for all citizens regardless of ability to pay. PHC4 has provided data to this entity in an effort to further PHC4's mission of educating the public and containing health care costs in Pennsylvania.
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- This analysis was not prepared by PHC4. This analysis was done by the Pittsburgh Regional Health Initiative. PHC4, its agents and staff, bear no responsibility or liability for the results of the analysis, which are solely the opinion of this entity. For more information about PHC4, please see <http://www.phc4.org/council/mission.htm>.
- ⁴ Southwestern Pennsylvania is an 11-county area including Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Somerset, Washington, and Westmoreland Counties.
- ⁵ Centers for Disease Control and Prevention, State of the HIV/AIDS Epidemic, HIV Incidence in the United States, August 2009, <http://www.cdc.gov/hiv/surveillance/incidence/sote/race-ethnicity.htm>.
- ⁶ Patients under the age of 65 qualify for Medicare if they are "permanently disabled" due to an impairment that prevents them from working for a year or more and is expected to result in death and they have earned enough work credits to receive Social Security Disability Insurance (SSDI). Typically, after disability determination, an HIV-positive individual (without end-stage renal disease) must wait 5 months before receiving SSDI and 24 months before receiving Medicare coverage. For more information, see Kaiser Family Foundation, HIV/AIDS Policy, Fact Sheet February 2009, http://www.kff.org/hivaids/upload/7171_04.pdf.
- ⁷ Kellerman, SE, Hanson, DL, McNaghten, AD, Fleming, PL. Prevalence of chronic hepatitis B and incidence of acute hepatitis B infection in human immunodeficiency virus-infected subjects. *J Infect Dis* 2003; 188:571.
- ⁸ Weber, R, Sabin, CA, Friis-Moller, N, et al. Liver-related deaths in persons infected with the human immunodeficiency virus. The D:A:D Study. *Arch Intern Med* 2006; 166:1632.
- ⁹ Chubineh S, McGowan J. Nausea and vomiting in HIV: a symptom review. *Int J STD AIDS* 2008; 19: 723-728
- ¹⁰ Phillips, A. Morbidity and mortality in the HAART era. Presented at the 15th Conference on Retroviruses and Opportunistic Infections, Boston, MA, February, 3-6, 2008; Plenary Session 5.
- ¹¹ Schambelan, M, Benson, CA, Carr, A, et al. Management of metabolic complications associated with antiretroviral therapy for HIV-1 infection: recommendations of an International AIDS Society-USA panel. *Journal of Acquired Immune Deficiency Syndrome* 2002; 31:257.
- ¹² Comorbid depression includes all the ICD-9 codes related to depression: 296.20, 296.21, 296.22, 296.23, 296.24, 296.25, 296.26, 296.30, 296.31, 296.32, 296.33, 296.34, 296.35, 296.36, 298.0, 300.4, 309.1, 311; Comorbid substance use disorder (SUD) includes all ICD-9 code groups related to alcohol or legal and illegal drug use include: 303 (alcohol dependence), 304 (drug dependence) and 305 (nondependent abuse of drugs).
- ^{xiii} Sherr, L, Lampe, F, Fisher, M., et al., Suicidal ideation in UK HIV clinic attenders, *AIDS*, 2008 Aug 20;22(13):1651-8 (documented 31%), http://journals.lww.com/aidsonline/Fulltext/2008/08200/Suicidal_ideation_in_UK_HIV_clinic_attenders.16.aspx
- ¹⁴ Because admissions later in the 12-month period do not have the same opportunity for a readmission as admissions early in the period, the 12 months percentages are not readmission rates. Rather, they are included to provide a relative benchmark among diagnoses.
- ¹⁵ Total charges reported to PHC4 are what the hospital bills for various components of a hospital admission. While related to what the insurer actually pays, total charges are not the amount the insurer actually pays.