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All-Cause Readmissions Following Hospital Stays for Patients With Malnutrition, 2013

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Introduction

Recent estimates indicate that 7 percent of nonmaternal and nonneonatal hospital stays in the United States are for patients with malnutrition,[1] defined here as undernutrition characterized by lack of adequate calories, protein, or other nutrients needed for tissue maintenance and repair.[2] Malnutrition has been associated with longer and more costly hospitals stays, as well as a greater likelihood of comorbidity and death among hospitalized patients.[3] Conceptually, malnutrition may also contribute to *posthospital syndrome*, described as "an acquired, transient period of vulnerability" following hospitalization,[4] which may dramatically increase risk of readmission.[5,6]

There are many causes of malnutrition.[7,8] Some cases involve chronic starvation related to conditions such as anorexia nervosa. In other instances, malnutrition may be a consequence of an acute or chronic illness or injury, such as burns or cancer. This heterogeneity has complicated recognition and proper treatment of malnutrition in hospital-based settings, as well as efforts to

Highlights

- In 2013, the all-cause 30-day readmission rate for patients with malnutrition was 23.0 per 100, compared with 14.9 per 100 for patients without malnutrition.

- Nearly 1 in 3 nonmaternal and nonneonatal stays for patients with postsurgical nonabsorption were followed by a readmission for any cause within 30 days (30.2 per 100).

- For all types of malnutrition combined, the rate of readmission was highest for index stays among adults aged 18–64 years, those paid by Medicaid, and those for patients residing in metropolitan areas.

- The readmission rate was similar across income levels for patients with malnutrition during an index stay; in contrast, the readmission rate decreased by income for patients without malnutrition at the index stay.

- The average cost per readmission was $16,900 for patients with protein-calorie malnutrition during an index stay and $17,900 for patients with postsurgical nonabsorption—26 and 34 percent higher, respectively, than the readmission cost for patients without malnutrition during an index stay ($13,400).

- Septicemia was the leading principal diagnosis at readmission among patients during an index stay involving all types of malnutrition, except postsurgical nonabsorption, for which complication of device (implant or graft) was the leading reason for readmission.

[1] Weiss AJ, Fingar KR, Barrett ML, Elixhauser A, Steiner CA, Guenter P, et al. Characteristics of Hospital Stays Involving Malnutrition, 2013. HCUP Statistical Brief #210. September 2016. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb210-Malnutrition-Hospital-Stays-2013.pdf. Accessed November 29, 2016.

[2] White JV, Guenter P, Jensen G, Malone A, Schofield M, Academy Malnutrition Work Group, et al. Consensus statement: Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition: characteristics recommended for the identification and documentation of adult malnutrition (undernutrition). Journal of Parenteral and Enteral Nutrition. 2012:36(3):275–83.

[3] Corkins MR, Guenter P, DiMaria-Ghalili RA, Jensen GL, Malone A, Miller S, et al. Malnutrition diagnoses in hospitalized patients: United States, 2010. Journal of Parenteral and Enteral Nutrition. 2014;38(2):186–95.

[4] Krumholz HM. Post-hospital syndrome—an acquired, transient condition of generalized risk. New England Journal of Medicine. 2013;368(2):100–2.

[5] Suaer A. Luo M. Role of Malnutrition in Increasing Risk of Hospital Readmissions. Abbot Nutrition Health Institute. December 2015. http://static.abbottnutrition.com/cms-prod/anhi.org/img/Role-Of-Malnutrition-In-Increasing-Risk-Of-Hospital-Readmissions-article.pdf. Accessed September 13, 2016.

[6] Guenter P, Jensen G, Patel V, Miller S, Mogensen KM, Malone A, et al. Addressing disease-related malnutrition in hospitalized patients: a call for a national goal. Joint Commission Journal on Quality and Patient Safety. 2015;41(10):469–73.

[7] Lean M, Wiseman M. Malnutrition in hospitals. BMJ. 2008;336(7639):290.

[8] White et al., 2012. Op. cit.

develop a standard definition of malnutrition for clinical and surveillance purposes.[9,10]

Inpatient outcomes—including length of hospital stay, costs, and mortality—appear to vary by malnutrition type. In the United States in 2013, the in-hospital death rate was 12 percent for stays involving cachexia (i.e., wasting syndrome) and 8 percent for those involving protein-calorie malnutrition, compared with 2–5 percent for stays with other types of malnutrition, including postsurgical nonabsorption, nutritional neglect, weight loss or failure to thrive, and underweight diagnoses.[11] Compared with other types of malnutrition, hospital stays involving protein-calorie malnutrition had the longest average length of stay and the highest average cost per stay.[12]

The frequency of readmissions following hospital stays involving malnutrition is largely unknown at a national level. Patients with malnutrition have been found to have a higher likelihood of readmission, but many studies have been conducted in other countries[13,14,15] or were limited to older adults,[16,17] individual hospitals,[18,19] or certain clinical populations.[20] More research on the epidemiology of readmissions following hospital stays for patients with malnutrition is warranted.

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief supplements a recent HCUP Statistical Brief that describes inpatient hospital stays among patients with six types of malnutrition: postsurgical nonabsorption, nutritional neglect, cachexia, protein-calorie malnutrition, weight loss or failure to thrive, and underweight.[21] The current Statistical Brief presents additional information on the all-cause 30-day rate of readmissions following an initial inpatient hospital stay for patients with malnutrition in the United States in 2013, following the same typology of malnutrition presented in the earlier Statistical Brief.

Malnutrition was identified at the initial inpatient stay, or *index stay*, as either a principal or secondary diagnosis. Analysis was limited to patients with a nonmaternal and nonneonatal index stay. A patient can have multiple index stays during the course of a year. Readmissions could be for any cause; thus, malnutrition may or may not have been recorded at the time of readmission. Thirty-day readmission rates are presented for the six types of malnutrition and across patient characteristics. For comparison, the readmission rate for nonmaternal and nonneonatal index stays among patients without malnutrition also is presented. Finally, costs and reasons for readmissions are presented by presence and type of malnutrition. All differences between estimates noted in the text are greater than 10 percent.

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Readmission rate by malnutrition type, 2013
Figure 1 displays the all-cause 30-day rate of readmission among patients with malnutrition following an index stay in 2013, according to type of malnutrition. For comparison, the readmission rate among patients without malnutrition at the index stay also is shown.

Figure 1. All-cause 30-day readmission rate by presence and type of malnutrition, 2013
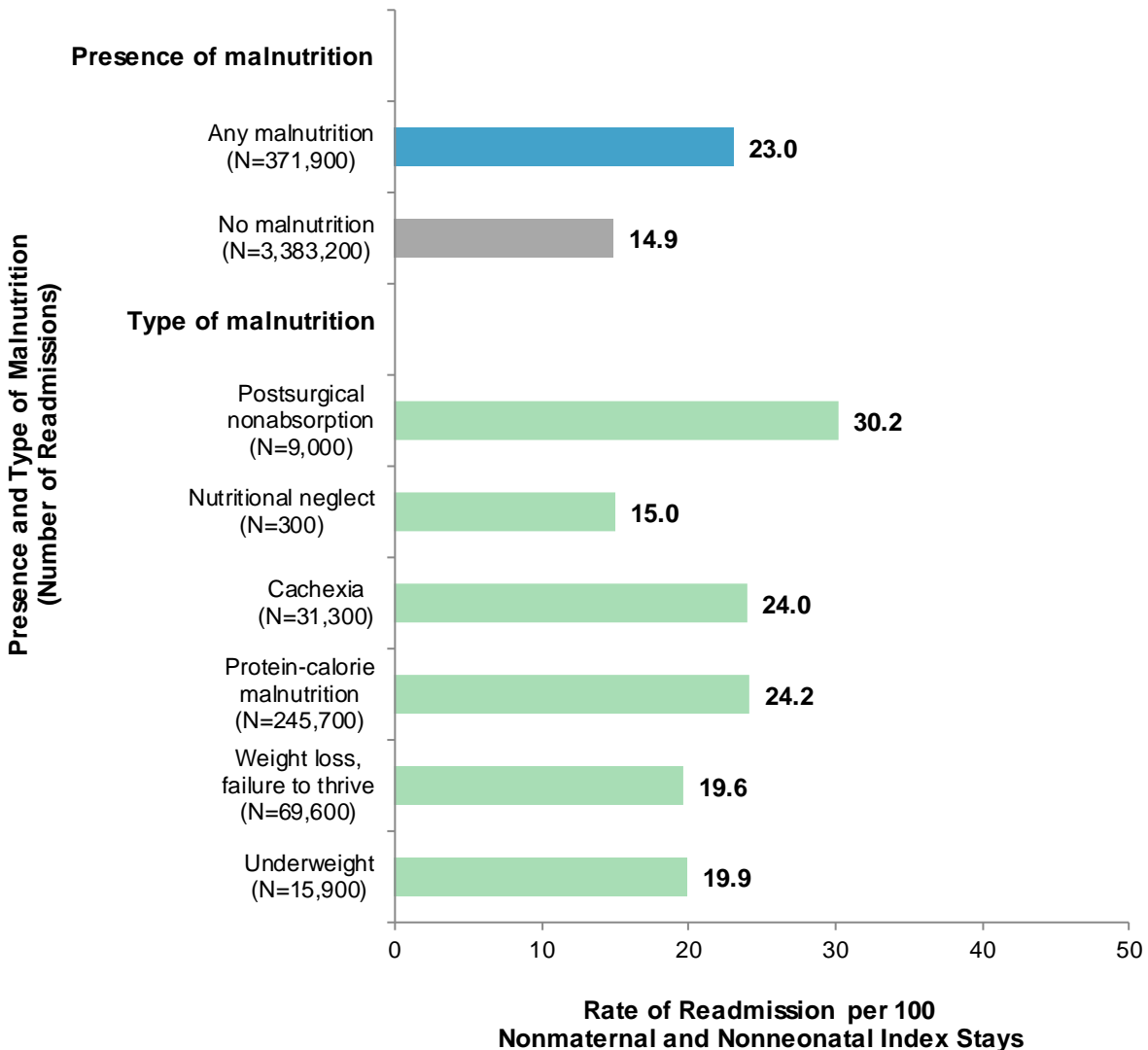
Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Readmissions Database (NRD), 2013

■ **Patients with hospital stays that involved malnutrition had a higher 30-day all-cause readmission rate than patients without malnutrition during the index stay.**

The 30-day readmission rate for any cause among nonmaternal and nonneonatal patients with an index inpatient hospital stay that involved malnutrition was 23.0 per 100 index stays, more than 50 percent higher than the rate among patients with no malnutrition during the index stay (14.9).

- **Nearly one-third of hospital stays for patients with postsurgical nonabsorption were followed by a readmission within 30 days—twice the rate of readmission among patients without a malnutrition diagnosis during the index stay.**

  The readmission rate following an inpatient hospital stay for postsurgical nonabsorption was 30.2 per 100 index stays. This was 2 times higher than the rate of readmission among patients without a diagnosis of malnutrition during the index stay (14.9 per 100 index stays). Compared with patients without malnutrition at the index stay, the readmission rate was also higher for patients with a diagnosis of cachexia (24.0), protein-calorie malnutrition (24.2), weight loss or failure to thrive (19.6), and underweight diagnoses (19.9) at the index stay. The readmission rate among patients with nutritional neglect during an index stay (15.0) was similar to that among patients without malnutrition.

- **Patients with protein-calorie malnutrition accounted for the largest number of readmissions among patients with a malnutrition-related index stay.**

  Although patients with a diagnosis of protein-calorie malnutrition at the index stay did not have the highest readmission rate, this type of malnutrition was the most frequent overall, accounting for the largest number of patients with malnutrition-related index stays (over 1 million, data not shown) and subsequent readmissions (245,700).

Readmission rate by patient characteristics, 2013
Figure 2 displays the all-cause 30-day rate of readmission among patients with any type of malnutrition during an index stay in 2013, overall and by patient characteristics. The readmission rate among patients without malnutrition at the index stay also is shown for comparison.

Figure 2. All-cause 30-day readmission rate among patients with any type of malnutrition during an index stay versus those without malnutrition, by patient characteristics, 2013
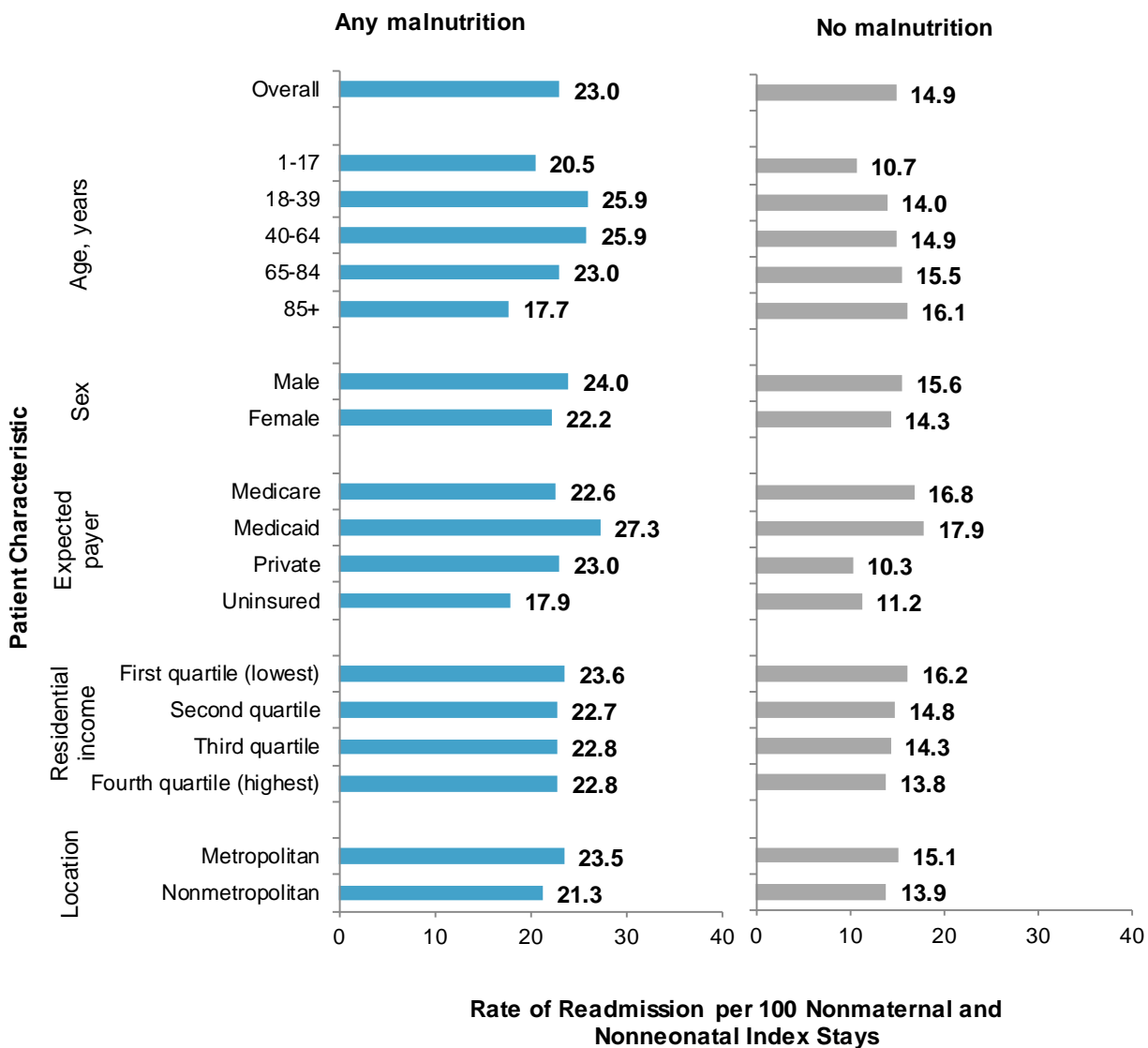
Patient Characteristic		Any malnutrition	No malnutrition
	Overall	23.0	14.9
Age, years	1-17	20.5	10.7
	18-39	25.9	14.0
	40-64	25.9	14.9
	65-84	23.0	15.5
	85+	17.7	16.1
Sex	Male	24.0	15.6
	Female	22.2	14.3
Expected payer	Medicare	22.6	16.8
	Medicaid	27.3	17.9
	Private	23.0	10.3
	Uninsured	17.9	11.2
Residential income	First quartile (lowest)	23.6	16.2
	Second quartile	22.7	14.8
	Third quartile	22.8	14.3
	Fourth quartile (highest)	22.8	13.8
Location	Metropolitan	23.5	15.1
	Nonmetropolitan	21.3	13.9

Rate of Readmission per 100 Nonmaternal and Nonneonatal Index Stays

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Readmissions Database (NRD), 2013

- **The readmission rate among patients with malnutrition during the index stay was highest among adults aged 18–64 years compared with the youngest and oldest patients.**

  Whereas the readmission rate among patients without malnutrition at the index stay increased with age, the readmission rate among those with any type of malnutrition was highest among adults aged 18–64 years (25.9 per 100 index stays) and lowest among children aged 1–17 years (20.5) and older adults (aged 65–84 years: 23.0; aged 85+ years: 17.7).

  In all but one age group, the readmission rate was higher for patients with a malnutrition-related index stay than for those without a malnutrition-related stay. The exception was adults aged 85 years or older, for which the rates differed by less than 10 percent (17.7 per 100 index stays involving malnutrition vs. 16.1 per 100 index stays without malnutrition).

- **For both males and females, the readmission rate was higher for patients with malnutrition at the index stay, compared with those without malnutrition.**

  Compared with patients who did not have a diagnosis of malnutrition at the index stay, the readmission rate was over 50 percent higher among patients with malnutrition, for both females (22.2 vs. 14.3 per 100 index stays) and males (24.0 vs. 15.6 per 100 index stays).

- **The readmission rate was highest among patients with malnutrition during an index stay paid by Medicaid.**

  Among Medicaid-covered patients with malnutrition, over a quarter of index stays were followed by a 30-day readmission for any cause (27.3 per 100). In comparison, the rate was 22.6 for Medicare, 23.0 for private insurance, and 17.9 for uninsured index stays with malnutrition.

  In each payer category, the readmission rate was higher for patients with a malnutrition-related index stay than for those without malnutrition. However, the disparity in readmission rates according to malnutrition status was particularly high among patients with private insurance, for which the rates differed by more than two-fold (23.0 per 100 index stays involving malnutrition vs. 10.3 per 100 index stays without malnutrition).

- **The readmission rate was similar across income levels among patients with malnutrition-related index stays, unlike patients without malnutrition for whom readmission rates were higher for patients from lower income communities.**

  The readmission rate among patients with any type of malnutrition during the index stay was similar across income levels (approximately 23–24 readmissions per 100 index stays). In contrast, among patients without malnutrition the readmission rate was 16.2 per 100 index stays for those residing in the lowest income areas (first quartile), compared with only 13.8 per 100 index stays for those residing in the highest income areas (fourth quartile). In each income quartile, the readmission rate was higher among patients with malnutrition than among those without malnutrition.

- **The readmission rate was highest for malnutrition-related index stays among patients who resided in metropolitan areas.**

  Among patients with malnutrition during an index stay, the readmission rate was higher for those who resided in metropolitan compared with nonmetropolitan areas (23.5 vs. 21.3 per 100 index stays). A similar pattern was seen for patients without a malnutrition-related index stay.

  For both metropolitan and nonmetropolitan areas, patients with malnutrition during an index stay had higher readmission rates compared with those without malnutrition.

Patterns in the rate of readmission across patient characteristics generally were similar for the different types of malnutrition, with several exceptions, which are discussed in Table 1.

Table 1 presents the readmission rate in 2013, according to presence and type of malnutrition and patient characteristics.

Table 1. All-cause 30-day readmission rate by presence and type of malnutrition, and patient characteristics, 2013

Patient characteristic	Any malnutrition	No malnutrition	Type of malnutrition					
			Postsurgical non-absorption	Nutritional neglect	Cachexia	Protein-calorie malnutrition	Weight loss, failure to thrive	Under-weight
Total readmitted, N	**371,900**	**3,383,200**	**9,000**	**300**	**31,300**	**245,700**	**69,600**	**15,900**
Total, rate	23.0	14.9	30.2	15.0	24.0	24.2	19.6	19.9
Age group, years, rate								
1–17	20.5	10.7	29.8	7.6	27.3	25.7	17.7	20.0
18–39	25.9	14.0	36.7	a	33.5	27.2	19.7	21.2
40–64	25.9	14.9	30.7	20.0	27.0	26.7	22.2	22.9
65–84	23.0	15.5	27.8	20.8	23.2	23.8	20.9	19.7
85+	17.7	16.1	20.5	14.6	17.4	19.0	15.5	15.6
Sex, rate								
Male	24.0	15.6	31.6	17.6	25.1	24.9	20.9	22.2
Female	22.2	14.3	29.3	12.9	22.7	23.5	18.5	18.6
Expected payer, rate								
Medicare	22.6	16.8	30.3	20.2	23.0	23.7	19.6	19.5
Medicaid	27.3	17.9	33.9	8.4	30.4	29.2	21.7	25.2
Private insurance	23.0	10.3	27.2	a	23.9	24.4	19.5	17.9
Uninsured	17.9	11.2	21.5	a	19.0	19.1	15.1	15.3
Community-level income, rate								
First quartile (poorest)	23.6	16.2	30.2	18.0	25.2	24.6	20.2	21.3
Second quartile	22.7	14.8	30.9	13.3	23.7	23.9	19.0	19.8
Third quartile	22.8	14.3	29.6	10.9	23.0	23.9	19.7	19.3
Fourth quartile (wealthiest)	22.8	13.8	29.3	18.0	23.1	24.2	19.5	18.5
Location of residence, rate								
Metropolitan	23.5	15.1	30.0	14.9	24.4	24.7	19.9	20.2
Nonmetropolitan	21.3	13.9	30.9	15.2	22.0	22.1	18.3	18.6

Note: Rate is per 100 nonmaternal and nonneonatal index stays.

a Suppressed due to cell size <11 readmissions.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Readmissions Database (NRD), 2013

■ **Patterns of readmission across patient characteristics were similar across most types of malnutrition, with a few exceptions.**

For all types of malnutrition combined, the rate of readmission was higher for index stays among adults aged 18–64 years, those paid by Medicaid, and those for patients residing in metropolitan areas, compared with other patient subgroups. The rate was similar (i.e., not different by more than 10 percent) for males and females, as well as across income categories (discussed above).

In contrast, for nutritional neglect the rate of readmission was higher among adults aged 40–84 years (20–21 readmissions per 100 index stays), males (17.6 per 100 index stays), those paid by Medicare (20.2 per 100 index stays), and patients who resided in the lowest and highest income areas (18.0 per 100 index stays in quartiles 1 and 4), compared with other malnutrition subgroups.

Readmission rates also were higher among males than among females for index stays that involved cachexia (25.1 vs. 22.7 per 100 index stays, respectively), weight loss or failure to thrive (20.9 vs. 18.5 per 100 index stays), and underweight diagnoses (22.2 vs. 18.6 per 100 index stays).

In addition, among patients with underweight diagnoses during an index stay, the readmission rate decreased with each quartile increase in income (21.3 per 100 index stays in quartile 1 vs. 18.5 in quartile 4), which was similar to the pattern observed among patients without malnutrition during an index stay.

Cost of malnutrition-related index stays and readmissions, 2013
Table 2 presents the average cost of index stays involving malnutrition and subsequent readmissions for any cause within 30 days, according to malnutrition type. For comparison, costs also are presented for index stays without malnutrition.

Table 2. Average cost of nonmaternal and nonneonatal index stays and subsequent readmissions, by presence and type of malnutrition, 2013

Malnutrition type at index stay	Average cost of index admission, $	Average cost of readmission, $	Marginal difference in cost of readmission, $	Change in cost of readmission, %
Presence of malnutrition				
Any malnutrition	21,200	16,200	−5,000	−30.9
No malnutrition	12,100	13,400	1,300	10.7
Type of malnutrition				
Postsurgical nonabsorption	21,400	17,900	−3,500	−16.4
Nutritional neglect	15,800	16,300	500	3.2
Cachexia	16,600	15,100	−1,500	−8.8
Protein-calorie malnutrition	25,500	16,900	−8,700	−33.9
Weight loss, failure to thrive	13,200	15,000	1,800	13.3
Underweight	12,400	13,700	1,200	9.8

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Readmissions Database (NRD), 2013

- **The average cost of readmissions was 31 percent lower than the cost of index stays among patients with malnutrition. In contrast, readmissions among patients without malnutrition cost 11 percent more than index stays.**

  Among patients with malnutrition during an index stay, the average cost of readmission was $16,200—30.9 percent lower than the cost of the index stay ($21,200). The reverse pattern was seen for patients without malnutrition during the index stay: the average cost per readmission was $13,400—11 percent higher than the cost of the index stay ($12,100).

- **The average cost of both index stays and readmissions was highest among patients with protein-calorie malnutrition or postsurgical nonabsorption, compared with other types of malnutrition or no malnutrition.**

  The average cost per index stay was $25,500 for patients with protein-calorie malnutrition and $21,400 for patients with postsurgical nonabsorption—higher than the cost of any other type of malnutrition-related stay, and 111 percent and 77 percent higher, respectively, than the cost of index stays for patients without malnutrition ($12,100). The average cost per readmission was 34 percent lower than the cost of index stays among patients with protein-calorie malnutrition ($16,900 vs. $25,500) and 16 percent lower than the cost of index stays among patients with postsurgical nonabsorption ($17,900 vs. $21,400).

Still, patients with protein-calorie malnutrition or postsurgical nonabsorption had the highest average cost per readmission compared with patients with other types of malnutrition (except nutritional neglect). These readmissions were 26 and 34 percent higher, respectively, than the cost per readmission among patients without malnutrition during the index stay ($13,400).

Reasons for malnutrition-related readmissions, 2013
The most common reasons for readmission among patients with malnutrition during an index stay in 2013 are provided in Table 3 (general reasons) and Table 4 (specific reasons), according to the type of malnutrition. Table 3 focuses on primary condition groupings, which are based on broad body systems or etiology, as defined by the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). Table 4 focuses on principal diagnoses, which are more specific categories of conditions. The most common reasons for readmission among patients without malnutrition at the index stay also are presented for comparison.

Table 3. Top five primary condition groupings at the readmission, by presence and type of malnutrition at the index stay, 2013

Primary condition grouping[a] at readmission	Any malnutrition		No malnutrition		Type of malnutrition											
					Postsurgical non-absorption		Nutritional neglect		Cachexia		Protein-calorie malnutrition		Weight loss, failure to thrive		Under-weight	
	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%
Total readmitted, N	371,900		3,383,200		9,000		300		31,300		245,700		69,600		15,900	
Digestive system	1	14.4	2	11.6	—	—	2	18.9	4	12.1	2	14.8	1	13.6	2	13.6
Infectious and parasitic	2	14.3	—	—	2	18.8	4	8.8	2	15.7	1	15.8	5	10.2	5	9.2
Respiratory system	3	13.1	3	11.2	3	11.8	—	—	1	18.0	3	12.8	4	12.3	1	17.3
Circulatory system	4	12.5	1	19.2	1	19.2	—	—	3	12.2	4	12.6	2	13.4	3	12.5
Injury and poisoning	5	10.5	4	11.2	5	9.1	1	27.5	—	—	5	11.0	—	—	4	9.4
Mental illness	—	—	5	9.4	4	10.2	—	—	—	—	—	—	—	—	—	—
Genito-urinary system	—	—	—	—	—	—	3	9.6	—	—	—	—	—	—	—	—
Endocrine, nutritional, metabolic	—	—	—	—	—	—	5	8.7	—	—	—	—	—	—	—	—
Neoplasms	—	—	—	—	—	—			5	10.3	—	—	3	12.8	—	—

Notes: A dash indicates that the condition did not rank among the top five primary condition groupings for that type of malnutrition. Denominators for all percentage calculations are the total number of hospital stays for each malnutrition type.

[a] Primary condition grouping was identified based on the diagnosis chapter of the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM).

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Readmissions Database (NRD), 2013

- **The leading primary condition groupings at readmission were similar for patients with or without malnutrition during an index stay.**

  The four leading primary condition groupings at readmission—circulatory system, digestive system, respiratory system, and injury and poisoning—were similar for patients with and without malnutrition during an index stay. However, infectious and parasitic diseases ranked in the top five leading primary condition groupings at readmission among patients with malnutrition, whereas mental illness ranked in the top five condition groupings among patients without malnutrition.

  Because most patients with malnutrition at the index stay had protein-calorie malnutrition, the leading reasons for readmission overall are driven by this one subgroup.

- **Neoplasms was the primary condition grouping in approximately 1 in 10 readmissions among patients with index stays involving cachexia or weight loss/failure to thrive.**

  Following an index stay for cachexia or weight loss/failure to thrive, 10.3 and 12.8 percent of readmissions, respectively, had a primary condition grouping of neoplasms. Neoplasms did not rank in the top five reasons for readmission among patients with other types of malnutrition during the index stay.

- **Injury and poisoning was the primary condition grouping for over one in four readmissions among patients with nutritional neglect during the index stay.**

  Injury and poisoning was the most common primary condition grouping for readmissions among patients with nutritional neglect during the index stay (27.5 percent of readmissions). Injury and poisoning also was a leading reason for readmission among patients with an index stay involving postsurgical nonabsorption (9.1 percent), protein-calorie malnutrition (11.0 percent), and underweight diagnoses (9.4 percent).

Table 4 lists the five most common principal diagnoses at readmission among patients with malnutrition during the index stay, by malnutrition type in 2013. These are more specific categories of conditions than the body system/etiology groupings in Table 3. The most common principal diagnoses at readmission among patients without malnutrition at the index stay also are presented for comparison.

Table 4. Top five principal diagnoses at readmission, by presence and type of malnutrition at the index stay, 2013

Principal diagnosis CCS at readmission	Any malnutrition		No malnutrition		Type of malnutrition											
					Postsurgical non-absorption		Nutritional neglect		Cachexia		Protein-calorie malnutrition		Weight loss, failure to thrive		Under-weight	
	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%
Total readmitted, N	371,900		3,383,200		9,000		300		31,300		245,700		69,600		15,900	
Septicemia (except in labor)	1	12.5	1	5.8	3	7.8	1	14.3	1	11.9	1	14.1	1	8.8	1	7.9
Complication surgery, medical care	2	4.2	3	4.7	2	8.5	—	—	—	—	2	4.7	—	—	5	3.3
Pneumonia	3	4.1	—	—	—	—	2	a	2	5.1	4	4.0	2	4.3	2	5.3
Complication device; implant, graft	4	4.1	4	3.5	1	17.4	—	—	—	—	3	4.1	—	—	—	—
CHF; non-hypertensive	5	3.8	2	5.4	—	—	3	a	4	4.1	5	4.0	3	3.8	4	3.5
Acute and unspecified renal failure	—	—	—	—	4	7.3	—	—	—	—	—	—	4	3.2	—	—
Fluid and electrolyte disorders	—	—	—	—	5	6.5	—	—	—	—	—	—	5	3.0	—	—
Acute cerebrovascular disease	—	—	—	—	—	—	4	a	—	—	—	—	—	—	—	—
Deficiency and other anemia	—	—	—	—	—	—	5	a	—	—	—	—	—	—	—	—
Resp. failure; insufficiency; arrest (adult)	—	—	—	—	—	—	—	—	3	4.2	—	—	—	—	—	—
COPD and bronchiectasis	—	—	—	—	—	—	—	—	5	4.0	—	—	—	—	3	4.4
Mood disorders	—	—	5	3.4	—	—	—	—	—	—	—	—	—	—	—	—

Abbreviations: CCS, Clinical Classifications Software; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease

Notes: A dash indicates that the condition did not rank among the top five primary condition groupings for that type of malnutrition. Denominators for all percentage calculations are the total number of hospital stays for each malnutrition type.

[a] Suppressed due to cell size <11 readmissions.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Readmissions Database (NRD), 2013

■ **Septicemia was more than twice as common at readmission for patients with any type of malnutrition compared with patients without malnutrition.**

Septicemia was the most common principal diagnosis at readmission regardless of whether patients had malnutrition present during their index stay. However, the proportion of readmissions for septicemia was more than twice as high among patients with malnutrition compared with those without malnutrition (12.5 vs. 5.8 percent).

Septicemia was the most common principal diagnosis among readmissions for five of the six specific types of malnutrition: nutritional neglect (14.3 percent), protein-calorie malnutrition (14.1 percent), cachexia (11.9 percent), weight loss or failure to thrive (8.8 percent), and underweight diagnoses (7.9 percent). For the sixth type of malnutrition—postsurgical nonabsorption—septicemia also ranked among the top five most common principal diagnoses at readmission (7.8 percent of readmissions), but complication of device (implant or graft) was the most common diagnosis at readmission (17.4 percent).

■ **Congestive heart failure and pneumonia were common principal diagnoses at readmission among patients with most types of malnutrition during the index stay.**

Other common principal diagnoses at readmission among patients with malnutrition during the index stay were congestive heart failure and pneumonia, which each constituted approximately 4–5 percent of readmissions among patients with cachexia, protein-calorie malnutrition, weight loss or failure to thrive, and underweight diagnoses. Pneumonia ranked among the top five leading diagnoses at readmission for patients with any type of malnutrition, but it did not rank in the top five diagnoses among patients without malnutrition.

Data Source

The estimates in this Statistical Brief are based upon data from the Healthcare Cost and Utilization Project (HCUP) 2013 Nationwide Readmissions Database (NRD).

Definitions

Diagnoses, ICD-9-CM, Clinical Classifications Software (CCS), and major diagnostic categories (MDCs)
The *principal diagnosis* is that condition established after study to be chiefly responsible for the patient's admission to the hospital.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are approximately 14,000 ICD-9-CM diagnosis codes.

CCS categorizes ICD-9-CM diagnosis codes into a manageable number of clinically meaningful categories.[22] This clinical grouper makes it easier to quickly understand patterns of diagnoses. CCS categories identified as Other typically are not reported; these categories include miscellaneous, otherwise unclassifiable diagnoses that may be difficult to interpret as a group.

MDCs assign ICD-9-CM principal diagnosis codes to one of 25 general diagnosis categories.

Case definition
The six types of malnutrition were defined at the index stay using the ICD-9-CM diagnosis codes listed in Table 5. Maternal and neonatal discharges, identified by MDC 14 (Pregnancy, Childbirth and the Puerperium) and MDC 15 (Newborns and Other Neonates With Conditions Originating in the Perinatal Period), were excluded from the analysis. Discharges identified only as a personal history or screening for malnutrition were not included (V12.1, personal history of nutritional deficiency; V77.2, special screening for malnutrition).

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[22] Agency for Healthcare Research and Quality. HCUP Clinical Classifications Software (CCS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated June 2015. http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Accessed February 17, 2016.

Table 5. ICD-9-CM diagnosis codes for malnutrition

Code	Description
Postsurgical nonabsorption	
579.3	Other and unspecified postsurgical nonabsorption
Nutritional neglect	
995.52	Child neglect (nutritional)
995.84	Adult neglect (nutritional)
Cachexia	
799.4	Cachexia
Protein-calorie malnutrition	
260	Kwashiorkor
261	Nutritional marasmus
262	Other severe protein-calorie malnutrition
263.0	Malnutrition of moderate degree
263.1	Malnutrition of mild degree
263.2	Arrested development following protein-calorie malnutrition
263.8	Other protein-calorie malnutrition
263.9	Unspecified protein-calorie malnutrition
Weight loss, failure to thrive	
783.21	Loss of weight
783.3	Feeding difficulties and mismanagement
783.41	Failure to thrive [child]
783.7	Adult failure to thrive
Underweight	
783.22	Underweight
V85.0	Body Mass Index less than 19, adult
V85.51	Body Mass Index, pediatric, less than 5th percentile for age

Each hospital stay involving malnutrition was categorized into only one malnutrition type based on the following hierarchy:

1. Postsurgical nonabsorption or nutritional neglect
2. Cachexia or protein-calorie malnutrition
3. Weight loss/failure to thrive or underweight

If a single inpatient record included multiple diagnosis codes indicating different types of malnutrition (e.g., nutritional neglect and weight loss), the record was classified into the higher ranked type of malnutrition (in this example, nutritional neglect). If both types of malnutrition at the same hierarchy level appeared on a discharge record (e.g., both postsurgical nonabsorption and nutritional neglect), then the record was classified into the malnutrition type that appeared first on the record.

Readmissions
The 30-day readmission rate is defined as the number of admissions for each condition for which there was at least one subsequent hospital admission within 30 days, divided by the total number of admissions from January through November of the same year. That is, when patients are discharged from the hospital, they are followed for 30 days in the data. If any readmission to the same or different hospital occurs during this time period, the admission is counted as having a readmission. No more than one readmission is counted within the 30-day period, because the outcome measure assessed is "percentage of admissions that are readmitted." If a patient was transferred to a different hospital on the same day or was transferred within the same hospital, the two events were combined as a single stay and the second event was not counted as a readmission; that is, transfers were not considered a readmission. In the

case of admissions for which there was more than one readmission in the 30-day period, the data presented in this Statistical Brief reflect the characteristics and costs of the first readmission.

Every qualifying hospital stay is counted as a separate initial (starting point) admission. Thus, a single patient can be counted multiple times during the course of the January through November observation period. In addition, initial admissions do not require a prior "clean period" with no hospitalizations; that is, a hospital stay may be a readmission for a prior stay and the initial admission for a subsequent readmission. Admissions were disqualified from the analysis as initial admissions if they could not be followed for 30 days for one of the following reasons: (1) the patient died in the hospital, (2) information on length of stay was missing, or (3) the patient was discharged in December.

Types of hospitals included in the HCUP Nationwide Readmissions Database
The Nationwide Readmissions Database (NRD) is based on data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). The NRD includes obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded are long-term care facilities such as rehabilitation, long-term acute care, psychiatric, and alcoholism and chemical dependency hospitals. However, if a patient received long-term care, rehabilitation, or treatment for a psychiatric or chemical dependency condition in a community hospital, the discharge record for that stay will be included in the NRD.

Unit of analysis
The unit of analysis is the hospital discharge (i.e., the hospital stay), not a person or patient. This means that a person who is admitted to the hospital multiple times in 1 year will be counted each time as a separate discharge from the hospital.

Costs and charges
Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare & Medicaid Services (CMS).[23] *Costs* reflect the actual expenses incurred in the production of hospital services, such as wages, supplies, and utility costs; *charges* represent the amount a hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used. Hospital charges reflect the amount the hospital billed for the entire hospital stay and do not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred.

Location of patients' residence
Place of residence is based on the urban-rural classification scheme for U.S. counties developed by the National Center for Health Statistics (NCHS). For this Statistical Brief, we collapsed the NCHS categories into either urban or rural according to the following:

Metropolitan:

- Large Central Metropolitan: includes metropolitan areas with 1 million or more residents
- Large Fringe Metropolitan: includes counties of metropolitan areas with 1 million or more residents
- Medium and Small Metropolitan: includes areas with 50,000 to 999,999 residents

Nonmetropolitan:

- Micropolitan and Noncore: includes nonmetropolitan counties (i.e., counties with no town greater than 50,000 residents).

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[23] Agency for Healthcare Research and Quality. HCUP Cost-to-Charge Ratio (CCR) Files. Healthcare Cost and Utilization Project (HCUP). 2001–2013. Rockville, MD: Agency for Healthcare Research and Quality. Updated November 2015. http://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp. Accessed February 17, 2016.

Median community-level income
Median community-level income is the median household income of the patient's ZIP Code of residence. Income levels are separated into population-based quartiles with cut-offs determined using ZIP Code demographic data obtained from the Nielsen Company. The income quartile is missing for patients who are homeless or foreign.

Payer
For this Statistical Brief, a hierarchy was used to assign the payer category based on the primary and secondary expected payer:[24]

- If the primary or secondary expected payer indicates Medicare, then the payer category is assigned to Medicare. This categorization includes patients who are dually eligible for Medicare and Medicaid under Medicare.
- If not Medicare and the primary or secondary expected payer indicates Medicaid, then the payer category is Medicaid.
- If not Medicare or Medicaid and the primary or secondary expected payer indicates private insurance, then the payer category is private.
- If not Medicare, Medicaid, or private and the primary expected payer indicates self-pay or no charge, then the payer category is uninsured.
- Stays for other types of payers are not reported in this Statistical Brief because this is a small group of mixed payers such as State and local programs.

Categorization of readmission counts and costs by expected payer was based on the index stay. The concordance between the expected payer coded at the index stay and the expected payer coded at readmission varies by payer: 98 percent for Medicare, 95 percent for Medicaid, 93 percent for private, and 80 percent for uninsured (percentages based on the 2013 NRD).

About HCUP

The Healthcare Cost and Utilization Project (HCUP, pronounced "H-Cup") is a family of health care databases and related software tools and products developed through a Federal-State-Industry partnership and sponsored by the Agency for Healthcare Research and Quality (AHRQ). HCUP databases bring together the data collection efforts of State data organizations, hospital associations, and private data organizations (HCUP Partners) and the Federal government to create a national information resource of encounter-level health care data. HCUP includes the largest collection of longitudinal hospital care data in the United States, with all-payer, encounter-level information beginning in 1988. These databases enable research on a broad range of health policy issues, including cost and quality of health services, medical practice patterns, access to health care programs, and outcomes of treatments at the national, State, and local market levels.

HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

Alaska State Hospital and Nursing Home Association
Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Hospital Association
District of Columbia Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Health Information Corporation
Illinois Department of Public Health

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[24] The 2013 NRD available for purchase through the HCUP Central Distributor includes the data element for the primary expected payer but not the data element for the secondary expected payer.

Indiana Hospital Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Louisiana Department of Health and Hospitals
Maine Health Data Organization
Maryland Health Services Cost Review Commission
Massachusetts Center for Health Information and Analysis
Michigan Health & Hospital Association
Minnesota Hospital Association
Mississippi Department of Health
Missouri Hospital Industry Data Institute
Montana MHA - An Association of Montana Health Care Providers
Nebraska Hospital Association
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health
New Mexico Department of Health
New York State Department of Health
North Carolina Department of Health and Human Services
North Dakota (data provided by the Minnesota Hospital Association)
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Office of Health Analytics
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina Revenue and Fiscal Affairs Office
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Health Care Authority
Wisconsin Department of Health Services
Wyoming Hospital Association

About Statistical Briefs

HCUP Statistical Briefs are descriptive summary reports presenting statistics on hospital inpatient, ambulatory surgery, and emergency department use and costs, quality of care, access to care, medical conditions, procedures, patient populations, and other topics. The reports use HCUP administrative health care data.

About the NRD

The HCUP Nationwide Readmissions Database (NRD) is a calendar-year, discharge-level database constructed from the HCUP State Inpatient Databases (SID) with verified patient linkage numbers that can be used to track a person across hospitals within a State. The 2013 NRD is available for purchase through the HCUP Central Distributor. The NRD is designed to support various types of analyses of national readmission rates. The database includes discharges for patients with and without repeat hospital visits in a year and those who have died in the hospital. Repeat stays may or may not be related. The criteria to determine the relationship between hospital admissions are left to the analyst using the NRD. The NRD was constructed as a sample of convenience consisting of 100 percent of the eligible discharges. Discharge weights for national estimates are developed using the target universe of

community hospitals (excluding rehabilitation and long-term acute care hospitals) in the United States. Over time, the sampling frame for the NRD will change; thus, the number of States contributing to the NRD will vary from year to year. The NRD is intended for national estimates only; no regional, State-, or hospital-specific estimates can be produced.

For More Information

For other information on malnutrition-related hospital stays in the United States, refer to the HCUP Statistical Briefs located at http://www.hcup-us.ahrq.gov/reports/statbriefs/sb_diabetes.jsp.

For additional HCUP statistics, visit:

- HCUP Fast Stats at http://www.hcup-us.ahrq.gov/faststats/landing.jsp for easy access to the latest HCUP-based statistics for health information topics
- HCUPnet, HCUP's interactive query system, at http://hcupnet.ahrq.gov/

For more information about HCUP, visit http://www.hcup-us.ahrq.gov/.

For a detailed description of HCUP and more information on the design of the Nationwide Readmissions Database (NRD), please refer to the following database documentation:

Agency for Healthcare Research and Quality. Overview of the Nationwide Readmissions Database (NRD). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated December 2015. http://www.hcup-us.ahrq.gov/nrdoverview.jsp. Accessed September 22, 2016.

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AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of health care in the United States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at hcup@ahrq.gov or send a letter to the address below:

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