VASCULAR ACCESS FOR IN-CENTER HEMODIALYSIS PATIENTS: PRELIMINARY FINDINGS

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Health Care Financing Administration

Supplemental Report #1

1999 ESRD Clinical Performance Measures Project
Opportunities to improve care for adult End-Stage Renal Disease patients

The Health Care Financing Administration *February 2000*

INTRODUCTION

The purpose of the Health Care Financing Administrations (HCFA's) End-Stage Renal Disease (ESRD) Clinical Performance Measures (CPM) Project is to assist providers of ESRD services in assessing and identifying opportunities to improve the care provided to adult (aged >= 18 years) in-center hemodialysis (HD) and peritoneal dialysis patients.

Information regarding aspects of care surrounding vascular access for HD patients was collected for the first time in the 1999 ESRD CPM Project. This supplemental report describes preliminary findings for vascular access issues in this HD sample by patient demographics, process of care parameters, and impact on delivered adequacy of dialysis. National estimates are presented, as well as regional comparisons.

METHODS

The Sample

In February 1999 a listing of all ESRD patients in their geographic area was obtained from each ESRD Network Organization. All in-center HD patients who were 18 years or older as of September 30, 1998 and alive on December 31, 1998 were identified and eligible for inclusion in the sample. A national random sample, stratified by Network, was selected from this universe of patients. An over-sample of incident patients (defined as those patients initiating their *most recent* maintenance course of hemodialysis on or between January 1, 1998 and August 31, 1998) was drawn to ensure a sufficient number of incident patients at the national level for subsequent analyses.

Data Collection

In May 1999, a two-page data collection form was sent to ESRD facilities providing care to selected patients. Clinical information in the selected patients' medical records was abstracted for each patient in the sample who was receiving in-center HD during the months of October, November, and December 1998. Patient characteristic information included gender, age, race, Hispanic ethnicity, years on dialysis, and primary cause of ESRD. Clinical information to assess the quality of care provided to these patients included the following: patient height, pre- and post-dialysis blood urea nitrogen (BUN) levels and pre- and post-dialysis weights (in kg) to calculate the urea reduction ratio (URR) and Kt/V values, dialysis session length, dialyzer codes (to determine dialyzer KUf), hemoglobin and hematocrit values, prescribed weekly epoetin alfa doses at the time the hemoglobin was drawn, transferrin saturations, serum ferritin concentrations, iron prescription practices, serum albumin values and the laboratory method used to determine the serum albumin values (bromcresol green [BCG] or bromcresol purple [BCP]).

Clinical information specifically regarding vascular access issues included the following: type of access at initiation of HD and date of placement, type of access 90 days after the initiation of HD, and current type of access (during the last quarter of 1998). If the current type of access was a catheter, the insertion location of the catheter, and whether or not the catheter had been used for 90 days or longer was collected. If the current type of access was either a synthetic or a bovine graft, additional information was requested to determine if routine monitoring (screening) for the presence of stenosis was performed during the study period, and if so, what type(s) of monitoring were utilized.

Completed forms were returned to the appropriate Network office where the data were reviewed and entered into a computerized database (Epi Info v. 6.04).[1] The data were aggregated and forwarded to HCFA for analysis. Epi Info, v. 6.04 and SPSS for Windows, v. 8.0[2] were utilized for the analysis.

Data Analysis

Univariate analyses were conducted to examine associations of access type by patient demographics, selected processes of care pertinent to delivery of dialysis, and geographic region. Separate analyses were conducted on both incident patients (defined

above) and prevalent patients (all patients in the sample for analysis). Access type was categorized as AV fistula, graft (synthetic or bovine), or catheter. Associations of access type with delivered dialysis (as measured by mean URR, mean Kt/V, URR >=65% and Kt/V >= 1.2) were examined. Differences in means for continuous variables were tested by two-tailed student's t-test. Associations of access type with categorical variables were tested by Chi square analysis. A p-value <0.05 was considered to be significant. Associations by racial group were restricted to whites and blacks only due to the low numbers in the other racial categories. All estimates presented in this Report are unweighted.

RESULTS

There were 8336 patients in the sample for analysis (94% response rate). 1621 patients (19%) of this sample were incident patients. Incident patients were more likely to be white ($p<0.001$) and have diabetes mellitus as the primary cause of ESRD ($p<0.01$) compared to prevalent patients (Table 1).

Twenty-seven percent of incident and 27% of prevalent patients were dialyzed with an AV fistula as their access type (Table 2). AV fistula access was more likely to be reported for younger (under 65 years), male, white, non-diabetic and non-hypertensive patients in both the incident and prevalent sub-groups ($p<0.001$). Patients dialyzing two years or more had the highest prevalence of AVFs and the lowest prevalence of catheters as their access type.

Process measures related to the delivery of dialysis were examined by access type. Both incident and prevalent patients dialyzed with catheters had significantly shorter dialysis session lengths and lower mean blood pump flow rates (Table 3). A smaller proportion of patients with catheters as their access type was treated with dialyzers with KUf >=20 mL/mmHg/h.

A pattern of lower delivered dialysis (as measured by either URR or Kt/V) with the use of catheters compared to the use of AV fistulae or grafts was noted for both incident and prevalent patients (Table 4).

There was significant regional variation in the percent of patients with an AVF as their access type and in the percent of patients with a catheter as their access type (Figures 1 and 2).

KEY OBSERVATIONS

- Younger patients, males, whites, and non-diabetics and non-hypertensives were more likely to have an AVF as their access type compared to older patients, females, blacks, and diabetics or hypertensives.

- As the patient's vintage (years on dialysis) increased, the use of AVFs increased and the use of catheters decreased.

- There is considerable room for improvement in increasing the placement of AVFs for in-center HD patients.

- There is considerable room for improvement in decreasing the use of catheters as the permanent access type for chronic in-center HD patients.

- Significant regional variation exists in the placement of AVFs in the U.S.

NEXT STEPS

Multivariate analyses to more fully understand the associations of patient characteristics and access types with outcomes of interest are being conducted. Dissemination and publication of results from these analyses are planned.

REFERENCES

1. Dean JA, Burton AH, Coulombier D, et al. Epi Info, Version 6.04a: a word processing, database, and statistics program for epidemiology on microcomputers. Centers for Disease Control and Prevention. Atlanta, GA . 1996.

2. Norusis MJ. SPSS for Windows Advanced Statistics. Release 8.0. Chicago, IL. 1997.

3. NKF-DOQI Clinical Practice Guidelines for Vascular Adequacy. Guideline #29. Am J Kidney Dis 1997;30 (Supplement 3).

TABLE 1: PATIENT CHARACTERISTICS OF THE INCIDENT^ AND PREVALENT^^ SAMPLES
1999 ESRD CPM PROJECT

Patient Characteristic	Incident n (%)	Prevalent n (%)
TOTAL	**1621 (100)**	**8336 (100)**
Gender		
Male	847 (52)	4449 (53)
Female	773 (48)	3878 (47)
Race (p<0.001)		
White	899 (55)	4167 (50)
Black	512 (32)	3145 (38)
Age group (years)		
18-44	241 (15)	1412 (17)
45-64	623 (38)	3202 (38)
65+	757 (47)	3720 (45)
mean (+/-SD)	61.2 (+/-15.2)	60.2 (+/-15.1)
median	63	62
Primary Cause of ESRD (p<0.01)		
Diabetes mellitus	728 (45)	3423 (41)
Hypertension	389 (24)	2127 (26)
Glomerulonephritis	161 (10)	1027 (12)
Other/Unknown	343 (21)	1759 (21)
Duration of dialysis (years)		
<0.5	356 (22)	1049 (13)
0.5-0.9	1155 (71)	1210 (14)
1-1.9	34 (2)	1731 (21)
2+	76 (5)	4345 (52)
post-dialysis body weight (kg)		
mean (+/-SD)	72.4 (+/-19.4)	73.3 (+/-19.7)
median	69.6	70.5

NOTE: Percents may not add up to 100% due to rounding.

^ Incident patients are defined as those patients initiating their *most recent* course of maintenance hemodialysis on or between January 1, 1998 and August 31, 1998.

^^ Prevalent patients include all patients in the sample for analysis (including incident patients).

TABLE 2: PERCENT OF PATIENTS WITH DIFFERENT ACCESS TYPES FOR INCIDENT AND PREVALENT SAMPLES 1999 ESRD CPM PROJECT

	Incident			Prevalent		
Patient Characteristic	**AVF^**	**Graft**	**Catheter**	**AVF**	**Graft**	**Catheter**
TOTAL	**27**	**48**	**25**	**27**	**53**	**20**
Gender						
Male	34*	43	24	36*	46	18
Female	19	54	27	17	61	22
Race						
White	28*	44	27	30*	49	22
Black	20	59	21	22	60	18
Age group (years)						
18-44	36*	37	26	36*	45	19
45-64	31	46	24	29	53	18
65+	20	54	26	22	56	22
Primary cause of ESRD						
Diabetes mellitus	24*	52	24	23*	57	20
Hypertension	24	51	26	27	55	18
Glomerulonephritis	36	44	20	36	47	16
Other/Unknown	31	39	30	31	47	22
Duration of dialysis (years)						
<0.5	NA			21*	38	40
0.5-0.9				27	49	24
1-1.9				28	53	19
2+				29	58	13
post-dialysis quintile body weight (kg)						
1 (lowest quintile)	23*	41	36	22*	51	27
2	28	48	24	26	53	20
3	30	50	20	31	52	17
4	28	52	19	30	54	16
5	25	52	23	26	56	17

NOTE: Percents may not add up to 100% due to rounding.

^ AVF = Arterial Venous fistula

* significant differences within sub-group - $p < 0.001$

TABLE 3: DIALYSIS ADEQUACY PROCESS MEASURES BY ACCESS TYPE FOR INCIDENT AND PREVALENT PATIENTS
1999 ESRD CPM PROJECT

Process measure		**Incident**			**Prevalent**	
	AVF	**Graft**	**Catheter**	**AVF**	**Graft**	**Catheter**
Dialysis session length (minutes)						
mean (+/-SD)	214(+/-29)*	208 (+/-29)	210 (+/-29)	217 (+/-31)**	210 (+/-30)	212 (+/-30)
median	210	210	210	215	210	210
Blood pump flow rate (mL/minute)						
mean (+/-SD)	379 (+/-64)**	396 (+/-63)	324 (+/-64)	398 (+/-67)**	405 (+/-64)	326 (+/-70)
median	383	400	317	400	400	317
Dialyzer KUf (mL/mmHg/h)						
1-9	33%	38%	39%	30%**	32%	38%
10-19	10%	10%	10%	12%	10%	11%
20+	57%	52%	51%	59%	58%	50%

NOTE: Percents may not add up to 100% due to rounding.

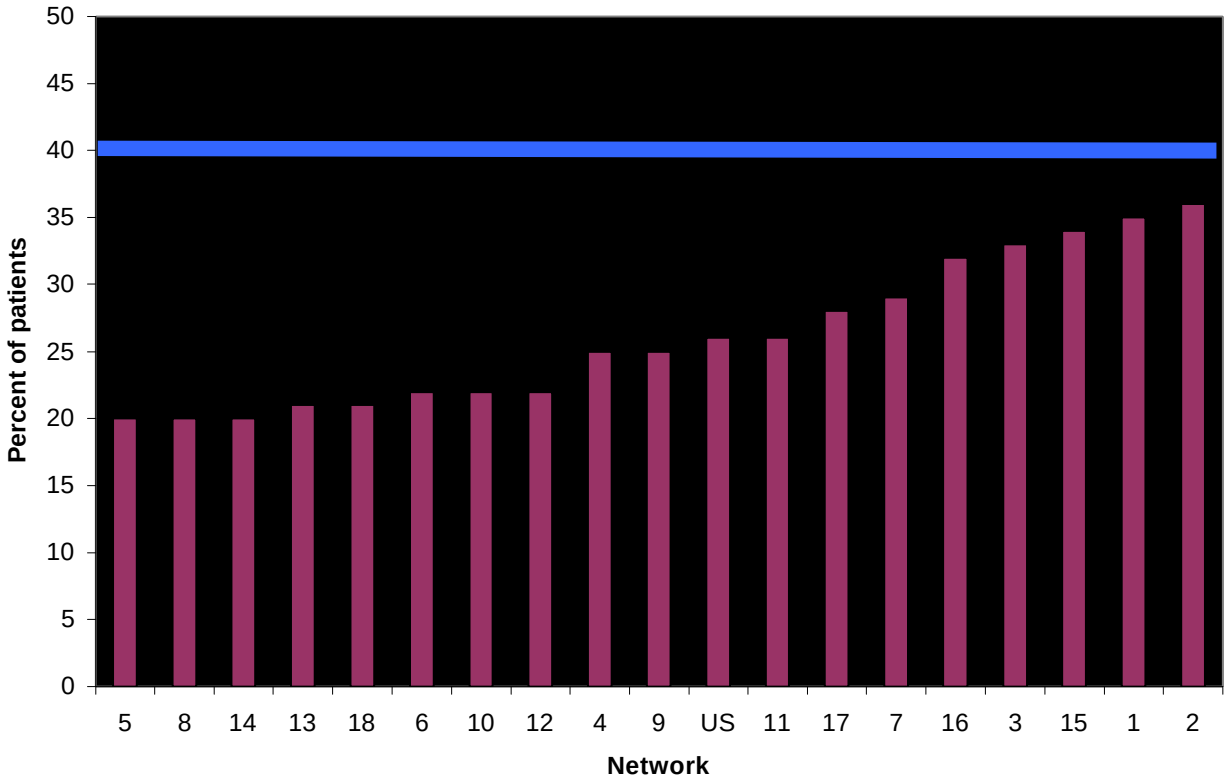
Significant differences within sub-groups - * $p<0.01$; ** $p<0.001$

TABLE 4: DELIVERED ADEQUACY OF DIALYSIS BY ACCESS TYPE FOR INCIDENT AND PREVALENT PATIENTS. 1999 ESRD CPM PROJECT

	Incident			Prevalent		
	AVF	**Graft**	**Catheter**	**AVF**	**Graft**	**Catheter**
URR (%)						
mean (+/-SD)	67.2 (+/-8.8)*	69.0 (+/-6.7)	64.8 (+/-9.4)	68.3 (+/-7.0)*	69.5 (+/-7.3)	65.0 (+/-9.2)
median	68.3	69.6	65.8	69.0	70.4	66.1
Kt/V						
mean (+/-SD)	1.37 (+/-0.28)*	1.42 (+/-0.25)	1.28 (+/-0.30)	1.41 (+/-0.26)*	1.44 (+/-0.25)	1.29 (+/-0.29)
median	1.36	1.42	1.28	1.40	1.45	1.29
Percent of patients with:						
URR >=65%	70*	77	53	75*	81	56
Kt/V >= 1.2	77*	81	62	82*	85	64

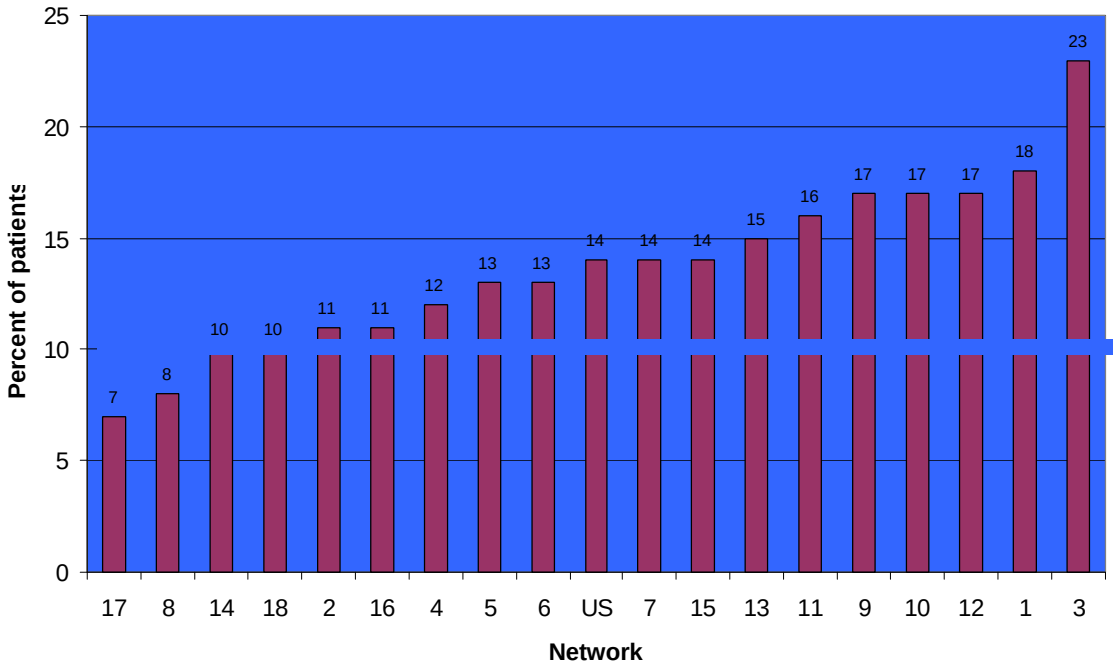
Significant differences within sub-groups - * $p<0.001$

Figure 1: Percent of prevalent in-center hemodialysis patients with an AVF as their current access type, by Network. 1999 ESRD CPM Project



NOTE: Current NKF-DOQI guidelines recommend that 40% of prevalent hemodialysis patients should have a native AV fistula as their permanent chronic dialysis access.[3]

Figure 2: Percent of prevalent patients with a catheter as their current access type for 90 days or longer, by Network. 1999 ESRD CPM Project.



NOTE: Current NKF-DOQI guidelines recommend that less than 10% of chronic maintenance hemodialysis patients should be maintained on catheters as their permanent chronic dialysis access.[3]