# Administration, # PATIENTS, DATA

From: Patricia K. Holahan (PKH) To: KSD Date: Monday, November 15, 1993 4:18 pm Subject: Procedures

Kitty,

This is the summary of the information Mark Rotman had compiled to estimate the number of procedures performed annually. In addition, he contacted the commercial nuclear pharmacies and based on the information provided, estimated that the number of nuclear medicine procedures performed annually was somewhere between 7 and 13 million/year. Needless to say, these numbers are not firm.

Trish

CC: SAM2, SXS4, CXH, JRS1

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Don Their estimates are speculation and they won't even stand by results. See yellow +ab.

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#### Source and Description of Data

One source of data comes from a publication by the National Center for Health Statistics (NCHS), entitled Vital and Health Statistics, Detailed Diagnosis and Procedures, National Hospital Discharge Survey, 1988. Series 13: Data from the National Health Survey No. 107. This report presents statistics on conditions diagnosed and surgical and non surgical procedures performed in non-Federal short stay hospitals. The statistics are based on data collected through the National Hospital Discharge Survey from a national sample of the hospital records of discharged in patients. Estimates of rates of all listed procedures per 10,000 population are shown by sex and age of patient and geographic region of hospital.

The staff obtained NCHS data for years '86 through '91 using only the ICD-9-CM Codes<sup>1</sup> considered to cover Radiation Oncology, and both Diagnostic and Therapy Nuclear Medicine by the Medical Visiting Fellow, Myron Pollycove MD.

NCHS then provided the total number of procedures, individually by code, then by sex, by age range, and by the 4 US Census regions.

A second source of data was the Health Care Finance Administration (HCFA) who was contacted by staff to request data for years '86 through '91 using CPT<sup>1</sup> codes considered to cover Radiation Oncology, and both Diagnostic and Therapy Nuclear Medicine by Medical Visiting Fellow, Myron Pollycove MD.

HCFA data are for medicare patients only. Medicare eligibility is determined by age 65 or older, and a history of social security tax payment. 99.1% of 65 and older are eligible and enrolled in Medicare, and 80.5% of enrollees utilize medicare. The HCFA data are for both in and out-patient (all places of service are listed), and is listed by insurance carrier (there is approximately one carrier per state).

HCFA reports 276,000 out of 31,276,000 patients aged 65+ are uninsured either by choice or ineligibility. (276,000/31,276,000=0.0089). HCFA reports 25,190,260 out of 31,276,000 patients aged 65+ utilized Medicare services in 1991. (25,190,260/31,276,000=0.805)

1 International Classification of Diseases, 9th rev, Clinical Modification, 3rd ed. These codes are quite broad in coverage. e.g., 92.02 is Liver Scan/ Radioisotope Function Study, covering all liver procedures. In contrast, 8 CPT codes to cover all liver procedures.

2 Current Procedural Terminology codes, are specific for a procedure, and the codes of choice for insurance billing. There are 7 CPT codes covering all bone imaging procedures, and only one ICD-9-CM code for bone.

## General Data Shortcomings

To capture all the radiologic procedures done in the US one must get information for in-patients and out-patients, and from all the places of service.

There is no one agency or organization that compiles radiologic procedure data covering everything the NRC needs to know, e.g., all specific codes, both inpatient and out-patient, and all places of service.

The data received are incomplete, missing out-patient information for patients 0 to 65 year old, and missing in patient and out-patient procedures performed in Federal hospitals (this is being pursued separately). Lastly the in and out-patient data for 65 and older patients only represents those utilizing medicare, about 80%.

### Specific Data Shortcomings

HCFA:

The data contains information only for 65 and older patients who have enrolled in and utilize medicare, e.g., 80.5% utilization rate, 99.1% eligible and enrolled.

The data were complied from CPT billing codes which sometimes contain multiple billings generated by a single administration of by product material.

The data does not provide information for each state. Thus, a state-by-state partition is not possible because the data are compiled for each insurance carrier. Also some of the insurance carriers cover more than one state.

NCHS:

The data provides information only for in-patients. (An out-patient survey is underway, but not yet available).

The data are estimates of rates of occurance developed via a national survey. (rate/10,000 population)

The data are not available for each state but are available by the four US Census Regions.

#### Comparison of HCFA and NCHS Data

Comparison of NCHS' 65 and older patient data with HCFA data shows a wide disparity in number of procedures. For example: NCHS lists 18,000 liver scan procedures (one ICD-9-CM code) for 65 and older in-patients, and HCFA lists 147,000 liver scan procedures (eight CPT codes) for 65 and older in-patients, using data for 1991. The reasons for the disparity are unclear. But probably lie in the codes used, the survey technique of NCHS versus the actual billings by CPT codes for subscribing hospitals, and that most nuclear medicine and radiation oncology procedures are out-patient. For Brachytherapy, the HCFA and NCHS (ICD-9-CM code 92.27, and CPT codes 77750 through 77799), numbers are similar. HCFA total procedures billed is 34,030, corrected for total population, gives 52,300 total. (Note: Of all patients diagnosed with a neoplasm, 65.1% are 65 and older. See Table 1. 34030/0.651=52,300). NCHS gives 20,000 in-patient procedures, corrected by a .375 to 1 in-pat to out-patient ratio (the average of all in to out-patient ratios for all Brachytherapy CPT codes from HCFA) gives a total of 53,300. This must be corrected by 0.805 - 0.009 to account for HCFA utilization, see assumption 2 below.

#### Assumptions

To estimate the total number of radiologic procedures based on using inpatient data and extrapolating for out-patients, and using data on patients 65 and older and extrapolating for younger patients requires several assumptions.

1. By examining the number of in-patients and out-patients treated for each procedure it may be possible to estimate the ratio of in- to out-patients. The ratio must be based on a specific procedure because the nature of the procedure is a determining factor in the place of service. For example: In the field of Brachytherapy, average ratio of In to Out-patient procedures is 0.375 to 1.0, (with a range of 0.02 to 1.0 for surface applications to 0.76 to 1.0 for simple intracavitary implants).

Thus, for data bases containing only in-patient data one would need to extrapolate to out-patient, using these ratios.

2. By examining the number of 65 and older patients and total patients (all ages) it may be possible to estimate the ratio of 65 and older patients to all age patients. Doing this ratio based on a specific procedure or disease is important because some diseases are clearly age related. In addition, the HCFA data must be corrected for the fraction of the aged 65+ population it represents, i.e., 0.805 (utilization rate) less 0.009 that are uninsured, assuming they do not receive any treatment. e.g., For a diagnosis of cardio-vascular disease, 77.8% of all patients are age 65 and older. See Table 1.

Thus, for data bases containing information only for 65 and older patients one would need to extrapolate to the total population using these ratios. For example: To extrapolate HCFA patient data for cardiovascular nuclear medicine from age 65 and older patients to all patients; 77.8 % of all circulatory disease diagnoses are for 65 and older patients (Table 1).

Using 1991 HCFA data for circulatory procedures (CPT codes 78460-99) shows 887,462 procedures. Correcting because this number it only represents 77.8% of the population, gives 1.141 million cardiovascular scans. Correcting for the fraction that HCFA represents, gives 1,406,634 cardiovascular scans.

Compare the above HCFA data to analagous NCHS data. ICD-9-CM code 92.05 is for heart procedures, contains a total of 126,000 in-patient cardiovascular procedures. Using a In to Out-patient ratio of 0.25 (represents 86% of all cardiac procedures) to extrapolate the HCFA data, the NCHS data would provide on estimate of 504,000 total cardiac scans. This difference illustrates the non-comparability of NCHS and HCFA data.

# TOTALS

NCHS Data: (ICD-9-CM codes)	
Therapy Procedures (except Brachytherapy) (92.2429) Brachytherapy (92.27) Nuclear Medicine (92.0119) Total	$69,930,070^{1} \\ 53,300^{2} \\ \frac{1,117,900^{3}}{71,101,270}$
HCFA Data: (CPT codes)	
Therapy Procedures (except Brachytherapy) (77401-77416) Brachytherapy (77750-77799) Nuclear Medicine (except therapy) (78000-78999) Nuclear Medicine Therapy (79000-79999) Total (7,151,134)	$   \begin{array}{r}     1,886,071^{4} \\     52,273^{5} \\     5,173,930^{6} \\     \underline{38,860^{7}} \\     8,803,445   \end{array} $
<ul> <li>Includes all radiation sources, X-Ray, Accerlator, and By-Presentation (100,000/0.00143*) (see footnote page 8)</li> <li>20,000/0.375* (average in/out-patient ratio from HCFA Brachyth 531,000/0.475*) (see footnote page 11, and " below)</li> <li>1,227,832/0.651* (fraction of pats 65+ diagnosed with neoplasm 34,030/0.661* (fraction of pats aged 65+ diagnosed with neoplasm 34,030/0.661* (fraction of pats aged 65+ diagnosed with neoplasm 34,030,316/0.663* (averaged fraction of patients aged 65+ from 83.3% of Nuclear Medicine Therapy is for Thyroid neoplasm (see page 12). Patients aged 65+ account for 28.6% of thyroid neoplasm (see page 12). Patients aged 65+ account for 28.6% of thyroid neoplasm (see 12,262 x 0.833 = 10,214 thy neoplasm Tx in-patients aged 10,214/0.286* = 35,714 thy neoplasm Tx expected for all 12,262 - 10,214= 2,048 other NMT therapy (NMT) in patient 2,048/0.651* (fraction of patients aged 65+ diagnosed with = 3,146 other NMT procedures expected for 35,714 + 3,146 = 38,860 total expected NMT procedures for HCFA reports 276,000 out of 31,276,000 patients aged 65+ are either by choice or ineligibility. (276,000/31,276,000=0.008 reports 25,190,260 out of 31,276,000 patients aged 65+ utili services in 1991. (25,190,260/31,276,000=0.805). Therefore: 7,151,134/0.805=8,883,396. less 0.009, is 8,883,396-79950=8*</li> <li>Dividing by a small number to develop an estimate makes the subject to significant change with only a minute change in t 7-13 x 10* is widely accepted range for radiopharmaceutical oper year, assuming a 1:1 relationship of dispensed to admini number seems very low.</li> </ul>	oduct herapy data) hs - table 1) isms-table 1) Table 1) ee footnote oplasms fore: 65+ patients s aged 65+ neoplasms) all patients uninsured 9). HCFA zed Medicare 8,883,445. estimate he denominator. doses dispensed stered, this

# Total of Fractions Delivered

HCFA data contains CPT codes 77420,25,30, each of these represents the completion (delivery) of 5 fractions of radiation. CPT codes 77431,70, and 99 are billings for completion of therapy consisting of 1 or 2 fractions, special treatment procedures, or an unlisted procedure.

CPT 77420,25,30 codes show 2,802,205 billings, and codes 77431,70, and 99 show 3C,821 billings. Correct the former number for all 65 and older patients (divide by .805), and for all patients with neoplasms (dividie by 0.651), and then multiply by 5 to get total number of fractions delivered for these codes, the number is  $26.7 \times 10^6$ , plus the later codes. Correct 38,821 for total number of patients and portion of 65 and older, and multiply by 1.5 to compute fractions, gives 0.111  $\times 10^6$ . Grand total 26.811  $\times 10^6$ .

If one 'guesstimates' each radiation therapy course consists of 20 fractions', then  $26.7 \times 10^6$  divided by 20 should give a guesstimate of the number of procedures.  $26,700,000/20=1.335 \times 10^6$  a number in the same order of magnatude as seen under all therapy procedures (except Brachy and Nuc Med) under totals.

\* Personal Communication with Dr. Greim, ACMUI. Radiation Therapy is about 50% palliative and 50% curative. Palliative is generally given in 10 to 15 fractions, and curative is generally given in 30 fractions. 20 fractions is a good guesstimate.

TABLE 1 Distribution of the Fraction of In-Patients Expected for an Age Group within a given Diagnosed Disease  $(\%)^1$ .

Diagnosed	Patients Age				Number
Disease <sup>2</sup>	0 thru 14	15 thru 44	45 thru 64	65+	of patients <sup>3</sup>
	Perc	cent of Total	by Age Group		
Infections	13.4	10.8	16.1	59.7	610
Neoplasms	1.6	5.4	27.9	65.1	1125
Endocrine	3.3	5.1	22.6	69.0	1990
Blood	4.6	9.0	18.3	68.2	591
CNS	12.8	7.0	18.6	61.6	818
Circulatory	0.3	1.9	19.9	77.8	5777
Respiratory	10.7	5.3	18.3	65.7	1943
Bone/Muscle	1.8	9.8	24.5	63.9	958

1 - From NCHS, Vital and Health Statistics, Series 13, No. 107, p 5, Table C.
 2 - These represent diseases most often diagnosed or treated with Nuclear

Medicine, or Radiation Oncology. 3 - Number of Patients per 10,000 population, 244,125,000 total population by US Census, 1988

		1331 MCH2		
Code	Description	Number RADIATION ONCOLOCY	65+	65/total
92.24 92.27 92.23 92.29	photon-lin acc brachytherapy tele - Co-60 + other rad ther total	26000 20000 15000 120000	15000 13000 7000 <u>32000</u> 67000 average	.58 .65 .47 .54 .56 <sup>1</sup>
		NUCLEAR MEDICINE		
92.01	thy scan & upt	9000		
92.02	Liver	43000	18000	.42
92.03	renal	26000	11000	.42
92.04	GI	26000	12000	.46
92.05	heart/hematopoiet	126000	68000	.54
92.12	head scan	8000	5000	.63
92.14	bone scan	133000	74000	56
92.15	lung	131000	66000	50
92 18	whole hody scan	8000	00000	
02 10	mise scan	21000	9000	20
56.19	total	531000	254000 20000	.30
1 Thin	is an avenue of all	the CE /total patient	254000 average	.49
Ints	is an average of all	the ob/total patient	ratios, range: 0.4/	10 0.05.

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It would be more accurate to weight (based on frequency) each 65/total patient

ratio prior to averaging. <sup>2</sup> This is an average of all the 65/total patient ratios, range: 0.42 to 0.63. It would be more accurate to weight (based on frequency) each 65/total patient ratio prior to averaging.

Code	Description	number RADIATION ONCOLO	<u>in pat</u>	in/out pat ratio
77401	Tx del orthovolt	70459	195	0028
77402	simp area 0-5MeV	48332	183 (Co-6)	0028
77403	6-10MeV	110527	183	0017
77404	11-19MeV	7653	14	0018
77406	at 20MeV	3223	2	0006
77407	2 areas	42438	33 (00-6)	0000
77408	6-10 mey	150511	142	0000
77409	11-19mev	33668	19	0006
77411	at 20mey	7405	2	.0003
77412	gt 2 areas	120719	233 (00-60	0019
77413	6-10mev	489128	604	0017
77414	11-19mev	114428	106	0009
77416	at 20mey	29341	24	.0009
	subtotal	1227832	1740 ave	001431
	0.2 x 0-5mev =	(42388 Co-60)	(90 (0-60)	1 age .00145
0	orr all ages (/.651)	(1886070)	(2673)	
	RA	DIATION TX MANAGE	MENT	
77420	5 frac given simp	450098	62687	
77425	intermed	606132	52586	
77430	complex	1745975	90777	
	subtotal	2802205	206050	
	(x5)	(14011025)	(1030250)	
	(/.651)	(21522311)	(1582565)	
77431	1-2 frac given sim	12594	1847	
77470	spec tx proc	10109	1443	
77499	unlist-misc proced	17118	809	
	subtotal	39821	4099	
	(x1.5)	(59731)	(6148)	
	(/.651)	(91753)	(9444)	
		BRACHYTHERAPY		
77750	infus/instill iso	459	195	.42
77761	intracavitary simp	9722	7420	.76
77762	intermed	4482	2980	.66
77763	complex	4135	2043	.49
77776	interstitial simp	555	303	. 55
77777	intermed	1117	645	.58
77778	complex	4972	2754	. 55
77781	hdr 1-4 sources	372	84	.23
77782	5-8 sources	589	100	.17
77783	9-12 sources	1112	134	.12
77784	gt 12	2555	398	.16
77789	surface applic	2892	70	.02
77799	misc unlisted proc	1068	185	.17
	subtotal	34030	17311 ave	arage .3751
1	(/.651)	(52273)	(26591)	

<sup>1</sup> This is an average of all the in/out patient ratios, range: 0.0003 to 0.0038 (Rad Onc), 0.02 to 0.76 (Brachy). It would be more accurate to weight (based on frequency) each in/out patient ratio prior to averaging.

<u>Code</u>	Description	NUCLEAR MEDICINE	<u>in pat</u>	in/out pat ratio
78000	Thy upt single	11857	1578	13
78001	-multiple	7605	1044	14
78006	thy imag + upt 1x	30433	4210	14
78007	multiple	20281	2513	12
78010	thy imaging only	36914	5763	16
78015	thy CA met imag	564	104	18
78018	-whole body	2586	479	19
78070	parathyroid	2215	500	26
78075	adrenals	203	46	.23
78099	unlisted endocrine	98	24	.24
78102	bone marrow imag	1355	431	.32
78103	-multiple	560	107	.19
78104	-whole body	2417	907	.38
78110	plasma vol	663	250	.38
78111	-multiple	529	101	.19
78120	red cell vol	791	233	.29
78121	-multiple	557	121	.22
78122	whole bld vol	545	152	.28
78130	red cell survival	180	92	.51
78135	-kinetics	105	39	.37
78140	rbc sequestration	175	88	.50
78160	iron turnover	24	4	.17
78162	iron absorp	3	1	.33
78170	iron utilization	61	49	.80
78172	total body iron	15	5	.33
78185	spleen imaging only	3985	1497	.38
78190	platelet surv-kinet	12	6	.5
78191	-survival	31	20	.65
78192	wbc localization	3234	1924	.59
78193	-whole body	9489	7669	.81
78195	lymph imaging	416	213	.51
78199	unlist hematopoetic	34	25	.74
78201	liver imag static	11202	4874	.44
78202	-w/flow	5389	2539	. 47
78205	liver imag spect	7630	3009	.39
78215	liver/spleen img	68089	32012	. 47
78216	-flow	13373	6283	. 47
78220	hepatobiliary func	23416	16779	.72
78223	-duct imaging	110444	80339	.73
78230	salivary imag	337	100	.3
78231	-serial imag	149	21	.14
78232	-function	78	15	.19
78258	esophageal	284	106	. 37
78261	-gastric mucosa	196	132	.67
78262	-reflux	1658	822	. 50
78264	gastric emptying	10198	5345	. 52
78270	b-12 abs	12710	4253	.33
78271	-w/intrinsic fact	3046	951	.31

Code	Description	number	in pat	in/out pat ratio
78276 78278 78280 78282 78290 78291 78299	GI bld loss locate -acute GI bld loss stool GI protein loss bowel imag LeVeen shunt unlisted GI	354 29609 8470 96 4435 776 530	331 25672 6847 66 3479 532 202	.94 .87 .81 .69 .78 .69 .38
78300 78305 78306 78310	bone imag limited -multiple -whole body -flow	67994 120238 943591 16875	20859 36473 283770 6660	.31 .30 .30
78315 78320 78350 78351	-3 phase study -spect bone density -dual photon	48813 8244 34167 679	21715 2096 826 30	.44 .25 .02
78399 78414 78428 78445	unlisted musc/bone cardiac ejec frac -shunt detect	182 1525 1179	25 1114 469	.14 .73 .40
78455 78457 78458 78458	thrombosis -imaging -bilateral	682 3612 7544	336 1715 3983	.60 .49 .47 .53
78461 78464 78465	-multiple -spect spect, multiple	48094 302234 27486 389189	14041 72480 6645 92646	.29 .24 .24 .24
78466 78468 78469 78472	heart imag infarct -w/eject frac -spect bld pool imag-gate	12943 797 3743 81973	9958 396 1562 57188	.77 .50 .42 .70
78473 78478 78480 78481	-multiple heart perf/wall mot -w/eject frac card bld pool 1st n	226 3 5 18816	97 3 4 9810	.43 1.0 .8
78483 78499 78580 78581	-multiple unlisted heart lung imag particles	281 1672 251665	39 675 198283	.14 .40 .79
78582 78584 78585	-w/vent & washout -single breath -rebreathing	38973 15868 78802	29998 12057 62191	.75 .77 .76 .80
78586 78587 78591 78593	-multiple pulm vent imag gas -rebreath	7561 57941 1881 73874	5174 44675 1534 58607	.68 .77 .82 .79
78594 78596 78599	-multiple v/q unlist lung	35547 2449 287	27937 1761 218	.79 .72 .76

Code	Description	number	<u>in pat</u>	in/out pat ratio
Code 78600 78601 78605 78606 78607 78610 78615 78635 78635 78635 78645 78650 78652 78655 78650 78652 78655 78650 78659 78655 78660 78699 78700 78701 78701 78704 78707 78710	Description brain imag ltd stat -w/flow -complete study -w/flow -spect brain flow only cerebral bld flow csf flow/imag -ventricle imag -ventricle imag -shunt eval csf leak detect -tomographic eye tumor ID tear duct imag unlisted CNS kidny imag static -w/flow -function -w/flow & funct kidney imag spect	number 607 865 2581 6063 7617 7147 3017 5030 82 984 411 411 45 576 35 12609 27559 22677 56143 816	<u>in pat</u> 287 452 1205 2756 3940 2317 1203 3200 49 435 155 170 22 31 15 7412 16321 13297 33106 291	in/out pat ratio .47 .52 .47 .45 .52 .32 .40 .64 .60 .44 .38 .41 .49 .05 .43 .59 .59 .59 .59 .59 .59 .36
78715	-vascul flow	5211	3510	.67
78725	kidney w/o p'col	10975	4929	.45
78726	-w/p'col	3643	1354	.37
78727	-transplant eval	5783	4151	72
78730	bladder resid	6834	1203	.18
78740	ureteral reflux	350	158	.45
78760	testicular imag	670	226	.34
78761	-w/flow	1063	443	.42
78800	unfisted genitourin	316	163	.52
78801	tumor local	4281	2359	.55
78802	-multiple	4646	2722	.59
78802	-whole body	22170	13918	.63
78805 78806 78999	abscess local -whole body unlisted misc total	6017 18260 5514 3,430,316	452 3985 13825 <u>628</u> 1,454,302	.43 .66 .76 .11 .475 <sup>1</sup> average

 $^{\rm 1}$  This is an average of all the in/out patient ratios, range: 0.002 to 1.0. It would be more accurate to weight (based on frequency) each in/out patient ratio prior to averaging.

Code	Description	number	in pat	in/out pat ratio
79000° 79030° 79035° 79100 79200 79300 79400 79400 79420 79440 79999	NUM hyperthy therapy hyperthy suppress thy CA ablation thy CA Tx - mets poly cyt vera-leuk intracavit colloid interstitial coll rn ther non thy/hem intra vascul partic intra articular unlisted therapy total	CLEAR MEDICINE T 8221 185 1200 607 860 204 17 465 7 52 <u>444</u> 12262	HERAPY 961 29 523 378 172 136 4 11 69 4 4 4 <u>82</u> 2369	.12 .16 .44 .62 .20 .67 .65 .15 .57 .08 .18 .349 <sup>1</sup>
	Grand total	3,442,578 (NM)	1,456,671 (1	NM)

\* The sum of these codes, 10,213 is 83.3% (10,213/12262=.8828) of all Nuclear

Medicine therapy procedures listed. <sup>1</sup> This is an average of all the in/out patient ratios, range: 0.08 to 0.67 It would be more accurate to weight (based on frequency) each in/out patient ratio prior to averaging.

#### Summary

The staff has located two major and several minor sources of data. The two major sources are NCHS and HCFA data, and they do not cover the entire spectrum of data required. HCFA and NCHS each collect data by different mechanisms, neither is designed to give accurate records of numbers of specific procedures, and as such, make comparison of the overlapping data nearly impossible. The HCFA and NCHS data do overlap, but, with the exception of Brachytherapy, do not agree. The data missing is outpatient data for patients under 65 years of age, and out patients treated by the Federal government (military, VA, and IHS). The Federal government data for inpatients is the minor sources.

An attempt was made to extrapolate data for the missing areas. The data estimates made by extrapolation are clearly unreasonable, and do not correspond to numbers of hospitals, licensees, or number of patients diagnosed with diseases treatable by Radiation Medicine.

It is clear that the data collected has merit and validity for the portion of the pie it represents, but unfortunately is only a portion , and cannot be extrapolated with confidence to give a total number of procedures.