

Department of Health and Human Services

**OFFICE OF
INSPECTOR GENERAL**

**DRG 121 VALIDATION STUDY UPDATE:
CIRCULATORY DISORDERS WITH
MYOCARDIAL INFARCTION AND
CARDIOVASCULAR COMPLICATIONS**



OCTOBER 1992

OFFICE OF INSPECTOR GENERAL

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Amy L. Lockwood of BOTEC Analysis Corporation prepared this report with direction from Janet W. Knight, BOTEC Project Director, and David C. Hsia, OIG Project Officer. Contract information and project participants are listed in Appendix A to this inspection.

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OCTOBER 1992 OEI-12-89-00194

EXECUTIVE SUMMARY

PURPOSE

This inspection reabstracted on a blinded basis, the International Classification of Diseases, 9th Edition, Clinical Modification codes from a sample of Medicare discharges billed as diagnosis-related group (DRG) 121. It compared the reabstracted DRG to the hospital-billed DRG for reimbursement changes. The sample was nationally representative and covered all of 1988, the most recent data available.

This inspection updated a previous Office of Inspector General (OIG) study. For 1985, the OIG found 17.7 percent errors among 76 reabstractions, improperly over-reimbursing hospitals by a projected \$42.2 million. This inspection used a parallel methodology to make these studies statistically comparable. Statistical tests determined whether numeric differences between 1985 results and 1988 results were real (statistically significant) or could be attributed to random error.

FINDINGS

DRG 121 billing errors not reduced

Of 115 discharges reabstracted for this inspection, 12.2 percent had billing errors. The difference between this result and the 17.7 percent error rate the OIG found for DRG 121 discharges in 1985 was not statistically significant. Further, the difference between this inspection's 12.2 percent error rate and the 14.7 percent errors for all discharges in 1988 also lacked statistical significance.

Financial impact not reduced

This inspection projected that DRG 121 billing errors over-reimbursed hospitals \$28.7 million. This result did not statistically differ from the \$42.2 million over-reimbursement in 1985. The increase in the number of DRG 121 bills in 1988 largely offset the decrease in the proportion of errors.

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INTRODUCTION

Background

Diagnosis-related group (DRG) 121 includes 12 International Classification of Diseases, 9th Edition, Clinical Modification (ICD-9-CM) codes. The ICD-9-CM codes may appear as either principal or secondary diagnoses. These ICD-9-CM codes identify complications to cardiovascular disease. To group to DRG 121, a bill must have codes for both an acute myocardial infarction and cardiovascular complications. The myocardial infarction must have occurred within eight weeks of the date of admission for the DRG 121 billing. Either diagnosis may appear as the primary or secondary diagnosis. [Appendix B].

DRG 121's weight decreased from 1.8454 in 1985 to 1.7162 in 1988. In October 1989, the HCFA altered DRG 121 by adding a fifth digit to ICD-9-CM code 410 to identify whether a given admission is the initial or subsequent treatment for a myocardial infarction. This change deleted the rule requiring that patients with an identified myocardial infarction or a myocardial infarction in the prior eight weeks be included in DRG 121. This change did not affect the period of this study.

In a previous study, the OIG found that DRG 121 had a disproportionately high proportion of billing errors.¹ Correct ICD-9-CM coding would have grouped 17.7 percent of its 76 reabstractions to different DRGs in 1985. These billing errors over-reimbursed the hospitals a projected \$42.2 million.

This inspection updated the previous study using 1988 data, the most recent available. It used a parallel methodology to make these inspections statistically comparable.

Methodology

This inspection randomly selected 115 DRG 121 discharges from 42 hospitals. The study population consisted of the 142,312 Medicare-reimbursed DRG 121 discharges during calendar year 1988. The design excluded discharges from specialty institutions such as children's hospitals, tuberculosis units, and psychiatric facilities. It also excluded discharges in Maryland and New Jersey, which the PPS still exempted in 1988. Finally, it excluded bills for pediatric, obstetric, and psychiatric DRGs (principally drug and alcohol rehabilitation performed by a general hospital).² Unlike its 1985 predecessor, it included hospitals established since the advent of the PPS in 1983.

The OIG requested that hospitals send complete copies of the sampled medical records to the OIG's contractor, Baxter-Health Data Institute (HDI) of Lexington, MA. The OIG followed-up missing records and issued subpoenas to compel the cooperation of four hospitals.

The OIG contracted with the American Medical Record Association (AMRA) to reabstract the charts. The AMRA selected ICD-9-CM codes supported by the record, determined the principle diagnosis, and grouped to select the correct DRG. To assure that the original ICD-9-CM codes and DRGs did not effect the reabstraction, the AMRA coders conducted their work without knowledge of the original ICD-9-CM codes and DRGs. The coders had instructions not to treat marginal problems or honest differences in judgement about appropriate coding as DRG errors. This standard should have produced a conservative estimate of the proportion of discharges having DRG errors. A series of reliability checks verified the reproducibility and accuracy of the AMRA coding. The AMRA also identified the reasons why a hospital's bill differed from the correct codes.

BOTEC Analysis Corporation of Cambridge, Massachusetts (BOTEC) edited the AMRA database, checked the sample's representativeness, and conducted statistical analyses of the correlates and financial consequences of DRG 121 miscoding. It also reweighted the 1985 data to improve comparability with this inspection. The t-test determined whether numeric differences between 1985 results and 1988 results were real (statistically significant) or could be attributed to random error.

Representativeness

To test the sample's representativeness, the OIG compared the distribution of sample bills to the distribution of the underlying population of DRG 121. The sample and population did not differ significantly with respect to hospital or patient characteristics. [Appendix C].

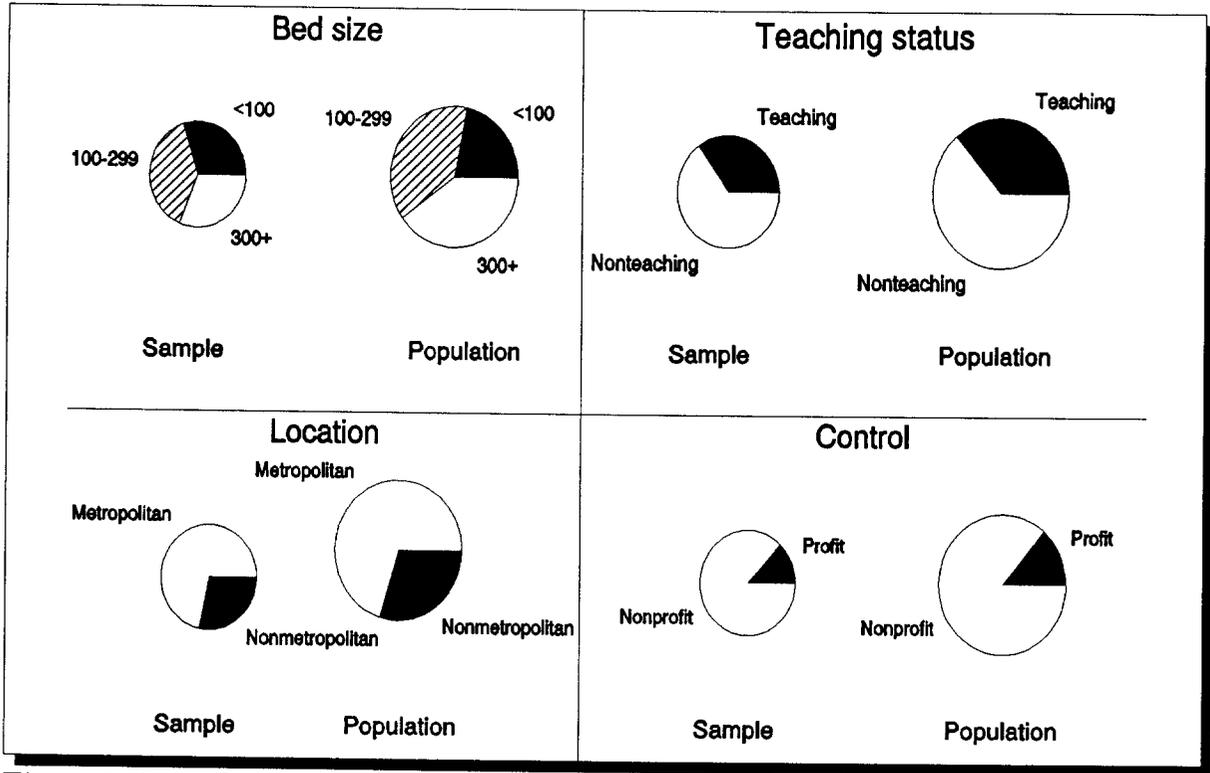


Figure 1: Sample representativeness by hospital demography, 1988

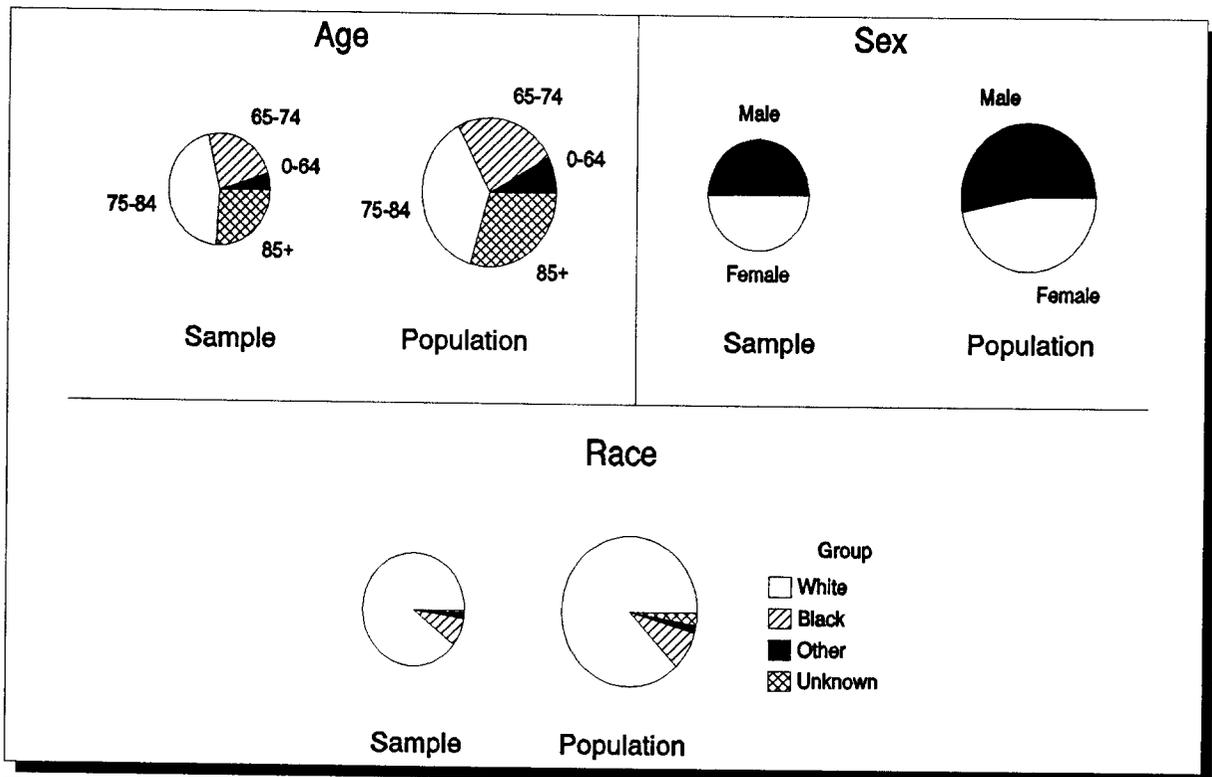


Figure 2: Sample representativeness by patient demography, 1988

FINDINGS

DRG 121 billing error not reduced

Of the 115 sample discharges, 12.2 percent had billing errors that changed their reimbursement from DRG 121. The difference between this result and the 17.7 percent error rate the OIG found in 1985 was not statistically significant.¹ This trend applied across most hospital and patient characteristics. Small hospitals, for-profit hospitals, and younger patients showed more improvement in coding accuracy. [Appendix D].

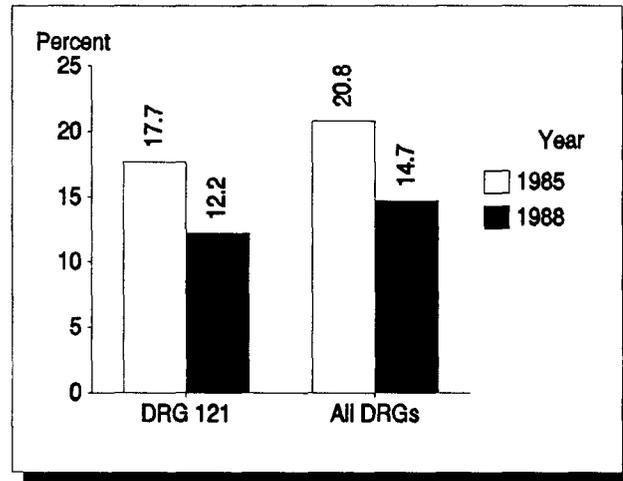


Figure 3: Coding errors, 1985 & 1988

This 1985-1988 decrease in the proportion of billing errors exceeded the improvement for all DRGs, from 20.8 percent in 1985 to 14.7 percent in 1988. The difference between this inspection's 12.2 percent DRG 121 errors and the 14.7 percent errors for all DRGs in 1988 was not statistically significant.³

All errors over-reimburse the hospitals

Of the 14 billing errors, all over-reimbursed to the hospitals. This proportion did not improve upon the 100 percent over-reimbursement reported for in 1985.

Over-reimbursement continues

The 115 sample discharges originally carried Relative Weights of 1.8454, equivalent to an average payment of \$5,638. The AMRA reabstraction reduced the case-mix index (CMI) by a statistically significant 0.0675. This reduction persisted across most hospital and demographic characteristics. The net CMI change in 1988 did not differ significantly from the net CMI change for DRG 121 in 1985. [Appendix E].

An extrapolation of the CMI change in 1988 to all 142,312 DRG 121 discharges from the hospital categories included in this sample projected that billing errors over-reimbursed hospitals a statistically significant \$28.7 million. This over-reimbursement

1. Because of the smaller sample size that results from DRG-specific analysis, estimates of coding for specific DRGs are less precise than OIG's national estimate. Statistical tests determined whether apparent differences were real (statistically significant) or could be attributed to random error.

did not statistically differ from the \$42.2 million over-reimbursement in 1985. The increase in the number of DRG 121 bills offset the nonsignificant improvement in coding accuracy.

Reasons for errors

The AMRA identified only two types of errors in the sample, mis-specification and "other." Mis-specification caused 85.7 percent of the 14 billing errors. This proportion did not statistically differ from in 1985. "Other" caused the remainder of the sample's billing errors. This proportion also did not statistically differ from 1985.

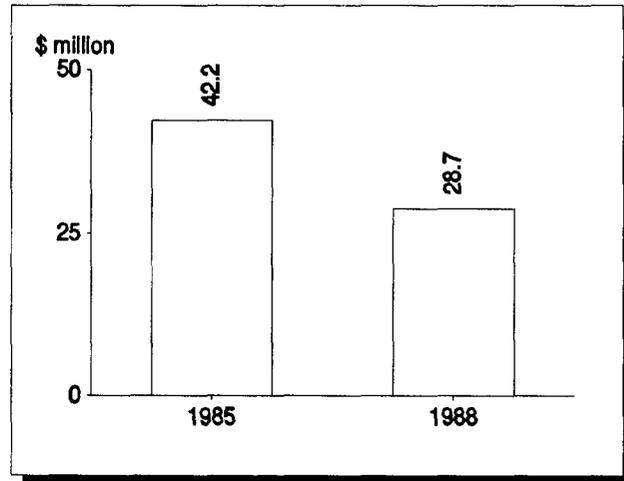


Figure 4: Financial impact of miscoding DRG 121, 1988 & 1985

ENDNOTES

1. Stone D, Kleiman M, Meyers M, Schutte J, Lee F, Hsia D, & Krushat M. DRG 121: Circulatory disorders with acute myocardial infarction and cardiovascular complications. Washington, DC: HHS Office of Inspector General, 1989. Publication no. OAI-12-88-01210.
2. Knight J W & Hsia D C, eds. National DRG Validation Study Update: Technical Report. Washington, DC: HHS Office of Inspector General, 1992. Inspection no. OEI-12-90-00191.
3. Knight J W & Hsia D C, eds. National DRG Validation Study Update: Summary Report. Washington, DC: HHS Office of Inspector General, 1992. Inspection no. OEI-12-90-00190.

APPENDICES

Appendix A: Project participants

OIG

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2. Now at Health Audit Services, Ellicott City, MD.

3. Now at the Journal of the American Medical Association, Chicago, IL.

4. Now at Johns Hopkins Medical Institutions.

5. Ceased operations February 16, 1990.

6. Outside contractor.

Rita M. Finnegan, R.R.A.
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Contract information

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Contract

HHS-100-90-0023
Firm-fixed price contract
\$203,257

Appendix B: ICD-9-CM codes in DRG 121

402 hypertensive heart disease with congestive heart failure
411.0 post-myocardial infarction syndrome
414 heart aneurysm
415.1 pulmonary embolism-infarction
426 atrioventricular block
427 tachycardia
428 congestive heart failure
429 papillary muscle rupture
441.0 dissecting aneurysm
458.9 hypotension
584 acute renal failure
785 shock

Appendix C: Sample representativeness

Number [percent]	Population	Sample	Chi-square
<u>Hospital demography</u>			
1-99 beds	21,874 [15.4]	14 [12.2]	1.02, 2 df, P=0.400
100-299 beds	55,381 [38.9]	49 [42.6]	
300+ beds	65,050 [45.7]	52 [45.2]	
Metropolitan	105,776 [74.3]	85 [73.9]	0.01, 1 df, P=0.071
Nonmetropolitan	36,536 [25.7]	30 [26.1]	
Teaching	55,599 [39.1]	43 [37.4]	0.12, 1 df, P=0.264
Nonteaching	86,713 [60.9]	72 [62.6]	
Profit	14,650 [10.5]	9 [7.8]	0.75, 1 df, P=0.610
Nonprofit	125,237 [89.5]	106 [92.2]	
<u>Patient demography</u>			
<65 years	8,061 [5.7]	2 [1.7]	3.46, 3 df, P=0.672
65-74 years	56,834 [39.9]	52 [45.2]	
75-84 years	56,279 [39.5]	44 [38.3]	
85+ years	21,138 [14.9]	17 [14.8]	
Male	71,330 [50.1]	49 [42.6]	2.26, 1 df, P=0.871
Female	70,982 [49.9]	66 [57.4]	
White	127,723 [89.7]	104 [90.4]	0.55, 3 df, P=0.093
Black	8,794 [6.2]	7 [6.1]	
Other	1,836 [1.3]	2 [1.7]	
Unknown	3,959 [2.8]	2 [1.7]	
Total	142,312 [100.0]	115 [100.0]	

Appendix D: Proportion of DRG 121 billing errors, 1985 and 1988

Number \pm standard error [percent]	1988	1985*	t-test
<u>Hospital demography</u>			
1-99 beds	1 [7.1 \pm 7.1]	8 [30.8 \pm 9.2]	3.87
100-299 beds	4 [8.2 \pm 4.0]	3 [12.0 \pm 6.6]	0.88
300+ beds	9 [17.3 \pm 5.3]	4 [16.0 \pm 7.5]	0.23
Metropolitan	10 [11.8 \pm 3.5]	8 [16.2 \pm 5.5]	0.87
Nonmetropolitan	4 [13.3 \pm 6.3]	7 [6.1 \pm 1.9]	1.89
Teaching	7 [16.3 \pm 5.7]	4 [3.5 \pm 1.6]	2.81
Nonteaching	7 [9.7 \pm 3.5]	11 [8.9 \pm 2.7]	0.22
Profit	0 [0.0 \pm 0.0]	1 [5.7 \pm 5.7]	3.50
Nonprofit	14 [13.2 \pm 3.3]	14 [18.3 \pm 4.8]	0.94
<u>Patient demography</u>			
<65 years	1 [50.0 \pm 50.0]	1 [25.0 \pm 25.0]	3.03
65-74 years	2 [3.8 \pm 2.7]	8 [24.7 \pm 7.6]	4.40
75-84 years	8 [18.2 \pm 5.9]	6 [24.0 \pm 9.5]	0.92
85+ years	3 [17.6 \pm 9.5]	0 [0.0 \pm 0.0]	3.80
Male	3 [6.1 \pm 3.5]	8 [17.1 \pm 6.0]	2.35
Female	11 [16.7 \pm 4.6]	7 [16.0 \pm 6.4]	0.11
White	11 [10.3 \pm 3.0]		
Black	3 [42.9 \pm 20.2]		
Other	0 [0.0 \pm 0.0]		
Unknown	0 [0.0 \pm 0.0]		
Total	14 [12.2 \pm 3.1]	15 [17.0 \pm 4.4]	0.92

* Reweighted for comparability to 1988.

Appendix E: DRG 121 case-mix index change, 1985 and 1988

Relative weight ± standard error	1988	1985	Difference	t-test
<u>Hospital demography</u>				
1-99 beds	-0.0227 ± 0.0227	-0.2362 ± 0.0758	0.2135	4.55
100-299 beds	-0.0417 ± 0.0209	-0.0774 ± 0.0434	0.0357	1.40
300+ beds	-0.1038 ± 0.0325	-0.0282 ± 0.0963	-0.0756	1.53
Metropolitan	-0.0672 ± 0.0207	-0.0673 ± 0.0508	0.0001	0.00
Nonmetropolitan	-0.0681 ± 0.0334	-0.0490 ± 0.0161	-0.0191	0.89
Teaching	-0.0962 ± 0.0345	-0.0061 ± 0.0210	-0.0901	3.15
Nonteaching	-0.0503 ± 0.0189	-0.0638 ± 0.0183	0.0135	0.61
Profit	0.0000 ± 0.0000	-0.0282 ± 0.0282	0.0282	3.50
Nonprofit	-0.0732 ± 0.0189	-0.0973 ± 0.0470	0.0241	0.57
<u>Patient demography</u>				
<65 years	-0.4313 ± 0.4313	-0.1803 ± 0.1803	-0.2510	3.89
65-74 years	-0.0198 ± 0.0138	-0.1275 ± 0.0695	0.1077	2.68
75-84 years	-0.0901 ± 0.0301	-0.1750 ± 0.0739	0.0849	2.03
85+ years	-0.1120 ± 0.0611	-0.0000 ± 0.0000	-0.1120	3.76
Male	-0.0423 ± 0.0244	-0.0516 ± 0.0689	0.0093	0.19
Female	-0.0862 ± 0.0246	-0.1271 ± 0.0557	0.0409	1.10
White	-0.0530 ± 0.0155			
Black	-0.3215 ± 0.1530			
Other	0.0000 ± 0.0000			
Unknown	0.0000 ± 0.0000			
Total	-0.0675 ± 0.0175	-0.0845 ± 0.0463	0.0170	0.39