# DRG 79: RESPIRATORY INFECTION

# OFFICE OF INSPECTOR GENERAL
## OFFICE OF ANALYSIS AND INSPECTIONS

# OFFICE OF INSPECTOR GENERAL

The mission of the Office of Inspector General (OIG) is to promote the efficiency, effectiveness, and integrity of programs in the United States Department of Health and Human Services (HHS). It does this by developing methods to detect and prevent fraud, waste, and abuse. Created by statute in 1976, the Inspector General keeps both the Secretary and the Congress fully and currently informed about programs or management problems and recommends corrective action. The OIG performs its mission by conducting audits, investigations, and inspections with approximately 1,200 staff strategically located around the country.

# OFFICE OF ANALYSIS AND INSPECTIONS

This report is produced by the Office of Analysis and Inspections (OAI), one of the three major offices within the OIG. The other two are the Office of Audit and the Office of Investigations. The OAI conducts inspections which are, typically, short-term studies designed to determine program effectiveness, efficiency, and vulnerability to fraud or abuse.

This inspection was conducted to analyze the characteristics of discharges paid as DRG 79. The report was prepared by BOTEC Analysis of Cambridge, MA under contract HHS-100-88-0019 and the Office of Analysis and Inspections, Health Care Branch. The following people participated in this project.

*David Stone, M.A., BOTEC Analysis*
*Marcia Meyers, M.P.A., BOTEC Analysis*
*Mark Kleiman, Ph.D, BOTEC Analysis*
*Jeremy Schutte, BOTEC Analysis*
*Fiona Lee, M.Ed., BOTEC Analysis*
*David Hsia, J.D., M.D., M.P.H., Health Care Branch*
*Mark Krushat, M.P.H., Health Care Branch*

# DRG 79:  RESPIRATORY INFECTION

RICHARD P. KUSSEROW
INSPECTOR GENERAL

# Contract Information

**Contractor**
BOTEC Analysis Corporation
Third Floor
36 JFK Street
Cambridge, MA 02138

Contract number
HHS-100-88-0019

**Project Officer**
David Hsia, J.D., M.D., M.P.H.
EHR G-10-C
Office of Inspector General
6325 Security Boulevard
Baltimore, MD 21207

# TABLE OF CONTENTS

## EXECUTIVE SUMMARY

### BACKGROUND

Under the prospective payment system, the diagnosis related group (DRG) 79 represents respiratory infections. This inspection determines the accuracy of billings to Medicare for DRG 79.

### FINDINGS

- Weighted by discharges, 17.4 percent of bills paid as DRG 79 should have been assigned to a different DRG. This error rate parallels the incidence for all DRGs as measured by the National DRG Validation Study.

- Hospitals overpaid themselves on *all* discharges incorrectly billed to DRG 79. This rate significantly exceeds the 59.6 percent rate for all DRGs in the National DRG Validation Study.

- Mis-specification of the principal diagnosis by the attending physician caused the most errors. "Other" errors occurred second most frequently.

- These bills should group principally to DRGs for respiratory or otolaryngological disorders. Better medical histories, diagnostic testing, or understanding of coding criteria would avoid such errors.

### RECOMMENDATIONS

- The Health Care Financing Administration (HCFA) should direct the peer review organizations (PROs) to review more DRG 79 bills for coding accuracy.

- The HCFA should direct the PROs to educate physicians and hospitals about the proper coding of DRG 79.

- The HCFA should direct the PROs to discourage the use of unnecessarily nonspecific disease codes in bills for respiratory diseases.


The HCFA disagrees with the first recommendation and agrees with the remaining recommendations. The Office of Inspector General modified this report in light of the HCFA comments, but continues to believe that full implementation of all its recommendations would recoup a projected $89.3 million in overpayments for Fiscal Year 1990.

# INTRODUCTION

## BACKGROUND

On October 1, 1983, the Health Care Financing Administration (HCFA) began implementing a new system of payment for inpatient hospital services under the Medicare program. The new prospective payment system (PPS) replaced the cost-based reimbursement system. Congress mandated this change because of rapid growth in health care costs, particularly inpatient expenses under Medicare.

Under PPS, hospitals received a pre-established payment for each discharge, based upon the diagnosis related group (DRG) to which the discharge is assigned. The PPS classified discharges into clinically coherent groups which used similar amounts of hospital resources, based on variables such as diagnosis; evaluation and treatment procedures; and patient age, sex, and discharge status. Each of the 473 DRGs had an associated relative weight, which represented the average cost for hospital care provided to patients with diagnoses grouping to that DRG as a proportion of the cost of the average patient. The hospital received this payment, independent of the actual length of hospitalization or cost of treatment for the individual patient. The hospital retained any surplus from patients consuming less than the expected amount of resources, and suffered losses on those patients consuming more.

The shift from cost-based, retrospective reimbursement to prospective payment constituted one of the most dramatic changes in health care reimbursement since the creation of Medicare. A fixed payment per discharge induced hospitals to implement economies and reduce unnecessary services. The total payments to the hospitals provided the same financial resources for patient care. In effect, PPS reversed the financial incentives for hospitals. Where the cost-reimbursement system rewarded longer hospital stays and more costly treatments, PPS rewarded earlier discharges and less costly procedures. One of the first consequences of the new payment system was a drop in average length of hospital stay for Medicare patients.

### PPS vulnerabilities

The advent of PPS created new opportunities for manipulation or "gaming" to increase hospital revenues from Medicare patients. To protect the integrity of PPS and maintain quality of care Congress established the peer review organizations (PROs) to monitor hospital activities.

The Office of the Inspector General (OIG) conducted the National DRG Validation Study (NDRGVS) to survey the general accuracy of DRG assignment and quality of care performed by hospitals under PPS. Its examination of 7000 medical records established that assignment errors resulted in $300 million in overpayments to hospitals and that the majority of overpayments could be traced to assignment errors affecting a small number of DRGs. This report is one in a series examining assignment accuracy of one of the DRGs identified as having the highest impact on overpayments under PPS and the greatest potential for cost recovery.

1

The PPS gaming takes two principal forms: optimization and creep. "Optimization" strategies adhere to coding rules, but maximize hospital reimbursements by selecting the most expensive among viable alternative principal diagnoses or adding more secondary diagnoses. The PPS permits optimization, which flows from the basic incentive structure of the PPS system.

"DRG creep" results from coding practices which do not conform to coding rules. Sources of DRG creep include:

- *Mis-specification:* The attending physician writes an incorrect principal diagnosis (defined by the Uniform Hospital Discharge Data Set (UHDDS) as "that condition established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care"), secondary diagnoses, or procedures on the attestation sheet.

- *Miscoding:* The hospital assigns incorrect numeric codes to diseases or procedures correctly attested to by the attending physician.

- *Resequencing:* The hospital substitutes a secondary diagnosis for the correct principal diagnosis.

Auditing and review practices seek to curtail illegal creep by identifying discharges in which coding rules are misapplied or ignored.

### Claims processing

Under PPS, the hospital files a claim for Medicare reimbursement upon discharging the beneficiary. At the time of discharge, the attending physician attests to the principal diagnosis which caused the patient's admission to the hospital, secondary diagnoses, and procedures (diagnostic and therapeutic) provided. The hospital translates the narrative diagnoses of the physician's attestation statement into numeric codes based on the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM), and prepares a claim. Fiscal intermediary (FI) organizations, working under contract with HCFA, enter the hospital's codes into the GROUPER computer program which assigns the appropriate DRG for reimbursement.

Hospital reimbursement is calculated by multiplying the "relative weight" of each DRG category by a standardized amount, as modified by certain hospital-specific factors. The relative weight of each DRG varies above or below 1.0000 according to the average amount of hospital resources used by patients in that diagnostic group. The higher the relative weight, the greater the reimbursement. Mis-assignment of the ICD-9-CM categories, or erroneous assignment or sequencing of patient diagnoses, can thus have significant financial implications.

### DRG 79

Under the prospective payment system, the DRG 79 represents major respiratory infections such as tuberculosis, klebsiella pneumonia, pseudomonas pneumonia, staphylococcal pneumonia, and aspiration pneumonitis. It does not pay for discharges grouping to the DRGs for simple pneumonia, bronchitis, respiratory failure, chronic obstructive pulmonary disease, pleural

2

effusion, or lung cancer. These DRGs may be present with superficially similar symptoms, but actually have entirely different underlying causes, prognoses, and resource consumption. Certain abscesses, parasites, and toxic injuries to the lung also fall under DRG 79.

**DRG 79**



- — Relative Weight
- ✱ Discharges (10 K)
- ⊟ Charges ($ 100M)
- ● Payment ($100 M)
- ✕ Mean payment ($ 1 K)
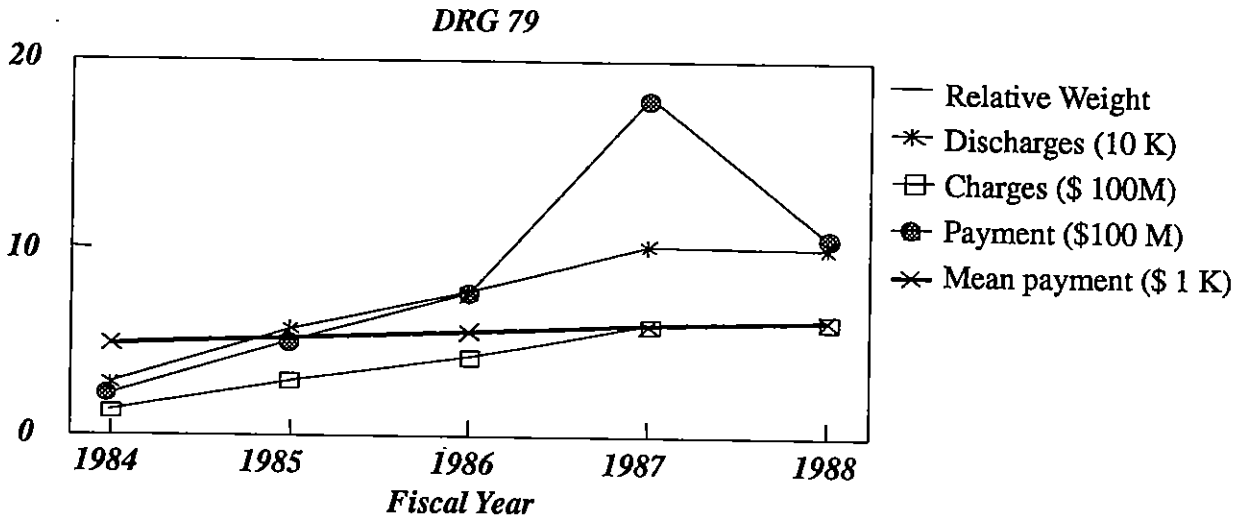
This study examines erroneous assignment and gaming in a single DRG: 79, respiratory infection. This DRG appears particularly vulnerable to mis-assignment due to its high relative weight (1.7795) and its high ratio of overpayments. [Appendix A-1]. Subsequent to the period examined by this study and effective Fiscal Year (FY) 1988, the HCFA altered DRG 79 to delete age over 69 years as a qualifying criterion, excluded certain complication codes, and created a new DRG for ventilator patients. These changes slightly reduce the number of discharges grouping to DRG 79.

## METHODOLOGY

This study used a stratified two-stage sampling design based on hospitals to select medical records for review. The first stage used simple random sampling without replacement to select up to 80 hospitals in each of three bed size strata: Less than 100 beds (small), 100 to 299 beds (medium), and 300 or more beds (large). The second stage of the design employed systematic random sampling to select up to 25 DRG 79 bills from each strata for Medicare discharges between October 1, 1984 and March 31, 1985.

*Figure 2: Sample Design*

- ▨ <100
- ▨ 100-299
- ☐ 300+



DRG 79          All DRGs

3

The OIG contracted with the Health Data Institute (HDI) of Lexington, Massachusetts to reabstract the medical records. Upon receipt, the contractor "blinded" the ICD-9-CM codes by covering them, and assigned an identification number to each record. An Accredited Record Technician or Registered Record Administrator proficient in ICD-9-CM coding reviewed the entire record to substantiate the principal diagnosis, other diagnoses, and procedures indicated by the attending physician in the narrative attestation form. Any records which did not support the assigned DRG classification were referred to physician reviewers. The physician reviewers designated the correct Uniform Hospital Discharge Data Set principal diagnosis, and additional diagnoses and/or procedures which were substantiated by the patient records. The GROUPER computer program processed the reabstracted ICD-9-CM codes to determine correct DRGs. A full discussion of the methodology and findings of the contractor record review is available in the final report of the National DRG Validation Study (available from OIG Public Affairs).

The OIG contracted with BOTEC Analysis of Cambridge, MA to examine this data to identify sources of assignment errors and make recommendations for recovery of overpayments.

## FINDINGS

### Sample characteristics

In FY 1985, 56,705 of the 8.3 million prospective payment discharges (0.7 percent) grouped to DRG 79. The National DRG Validation Study estimates that they came principally from large and medium size hospitals. In the first half of FY 1985, the 239 hospitals selected in stage-one of the sample design (the sampling frame) billed for 222,396 discharges of which 1,432 came from DRG 79. [Appendix A-2].

*Figure 3: Hospital Demography*
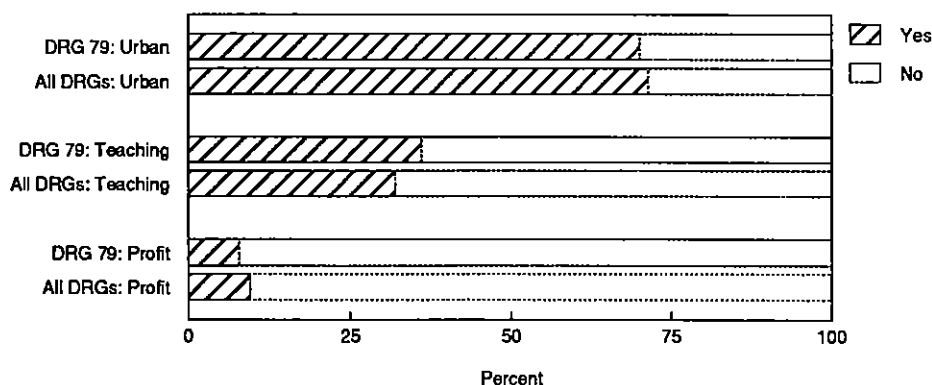


Additionally, the two-stage sample design permits calculation of separate results for Medicare beneficiaries (the probability of something happening to a person) and hospitals (the odds of an event at a particular hospital). Therefore, the appendices, tables, and charts report individual totals weighted by both discharges and hospitals.

The majority of DRG 79 discharges, reflected both in the sample numbers and in the discharge-weighted percentages, were from urban, nonteaching, and nonprofit hospitals. [Appendix A-3]. For each hospital type, the discharge-weighted percentage mirrored those in the National DRG Validation Study. [Appendix A-4].

The DRG 79 discharges were, on average, older, male, longer staying, and more expensive than discharges from either the National DRG Validation Study or the Medicare population. [Appendix A-5]. There were no instances of mortality in the DRG 79 sample. [Appendix A-6].

*Assignment errors*

Weighted by discharges, 17.2 percent of bills paid as DRG 79 grouped to a different DRG after reabstraction. Assignment errors (33.3 percent) occurred more frequently in small hospitals' bills for DRG 79 than for all DRGs (23.6 percent).

### Patient Demographics

|  | DRG 79 | National DRG Validation Study | All Medicare |
|---|---|---|---|
| Age (years) | 77.5 | 73.6 | not available |
| Sex (% male) | 54.6 | 46.2 | 42.2 |
| LOS (days) | 11.1 | 7.5 | 7.8 |
| Payment ($) | 5205.5 | 3150.0 | 2985 Urban 2381 Rural |
| Mortality (%) | 0.0 | 6.3 | not available |

In hospitals of 300+ beds, the 8.0 percent, discharge-weighted rate of assignment errors for DRG 79 was less than half the 16.6 percent reported in the National DRG Validation Study. [Appendix B-1].

### Coding Errors
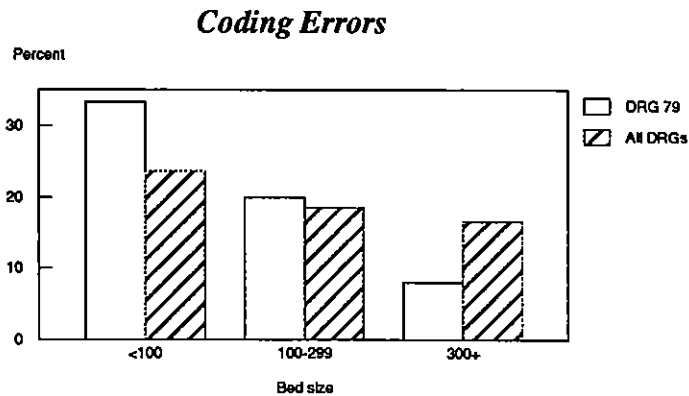


Urban, nonteaching, and nonprofit hospitals had significantly higher percentages of errors than did their rural, teaching, and for-profit counterparts. However, as a percent of the total discharges, none had an error rate above 16 percent. Comparison to the hospital demograph-

ics for all discharges reveals that only urban hospitals have a higher error rate for DRG 79 than for all DRGs. [Appendix B-2].

Discharges incorrectly paid as DRG 79 had a slightly older average age (78.7 years versus 77.4 years), lower proportion of males, and much shorter lengths of stay than those assigned correctly. In the case of length of stay, the disparity was most pronounced in large hospitals where those incorrectly assigned as DRG 79 had average stays of 4.5 days while those assigned correctly averaged stays of 13 days. In the case of average payment, in both small and medium sized hospitals, payment for discharges assigned incorrectly exceeded payment for discharges assigned correctly. [Appendix B-3].



Percent                          *Direction of Errors*

Legend:
☐ DRG 79: Overpayment
▓ DRG 79: Underpayment
▨ National DRG: Over
▨ National DRG: Under

Bed size: <100, 100-299, 300+
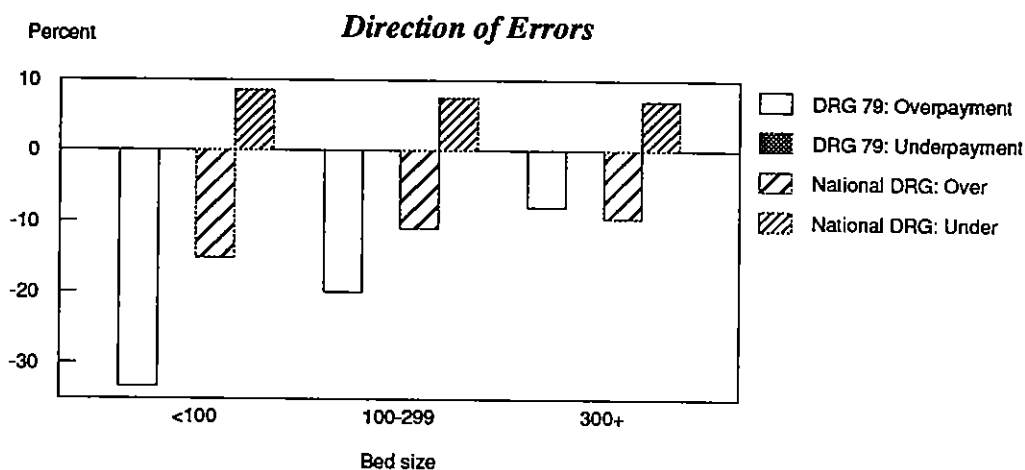
*Direction of errors*

As indicated, all of the errors in DRG 79 resulted in overpayments to hospitals. [Appendix C-1]. The National DRG Validation Study found that only 61 percent of the errors resulted in overpayments to hospitals. [Appendix C-2].

*Source of errors*

The majority of errors in DRG 79 discharges occurred when hospitals incorrectly coded the discharges as DRG 79 and billed it accordingly. Only 2 of the 15 errors resulted when medical records correctly indicated a different diagnosis, but the hospital administration billed it as DRG 79 anyway. Both of the billing errors occurred in small hospitals. [Appendix D-1.]

*Reasons for errors*

Narrative errors by the attending physician caused a plurality of errors in coding to DRG 79. [Appendix E-1]. The remainder of the errors divided among miscoding, resequencing, and other types of errors. [Appendix E-2]. Resequencing errors occurred less often in DRG 79 than in the National DRG Validation Study. [Appendix E-3].

6

**Reasons for Errors**

- ☐ Misspecification
- ▨ Miscoding
- ▦ Resequencing
- ▨ Other

DRG 79          All DRGs
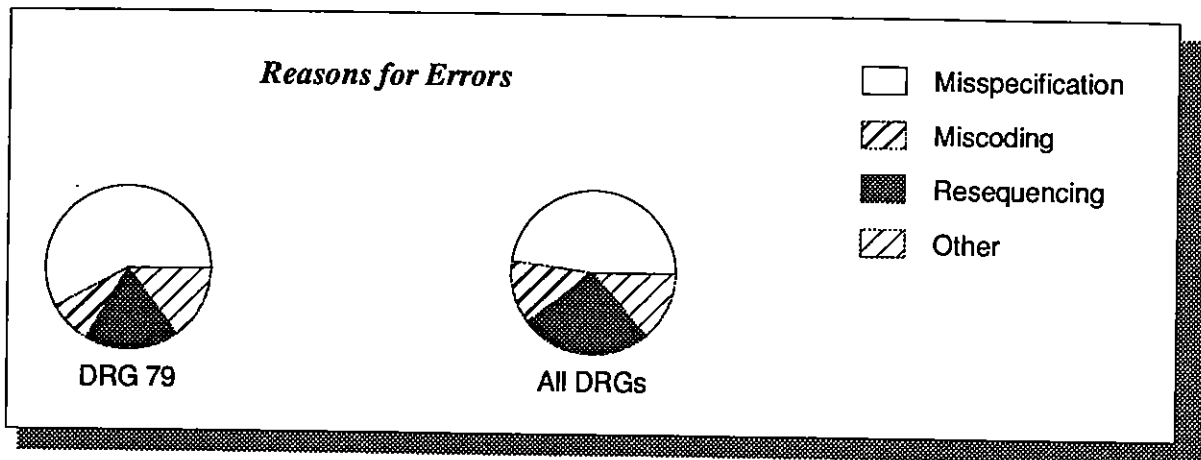
Discharges with resequencing errors proved to be significantly older than those subject to other types of errors. Discharges with resequencing errors also had substantially higher rates of payment. [Appendix E-4].

### Financial effects

After reabstraction, the average relative weight for discharges in this sample dropped from 1.7795 to 1.5839. [Appendix F-1]. For the 74 discharges in this sample, this equalled an faggregate drop in relative weight of -14.4744. Weighted by discharges, these changes imply a 9.7 percent decrease, representing overpayments to the hospitals due to coding errors. [Appendix F-2].

Extrapolated to the entire Medicare population, errors in assignment to DRG 79 resulted in $28.3 million of overpayments during the study year. Mid-sized hospitals were responsible for the largest share of the overpayments. The rapid increase in DRG 79 reimbursement implies overpayments of $77.6 million in FY 1989 and $89.3 million in FY 1990. [Appendix F-3].

### Correct DRG assignment

The DRG 79 falls into Major Diagnostic Category (MDC) 04: Respiratory diseases. The coding 15 errors in this sample spread across seven MDCs. [Appendix G-1]. The MDC 03 (Ear, nose, and throat) accounted for 20.0 percent of the errors. Within this MDC, all errors should have assigned to DRG 73: Other ear, nose and throat. This DRG has a relative weight of 0.5163, compared to the 1.7795 for DRG 79. [Appendix G-2].

Turning to principal diagnoses correctly billed to DRG 79, aspiration pneumonitis, klebsiella pneumonia, pseudomonas pneumonia, and staphylococcal pneumonia appear most frequently. Interestingly, the correct diagnoses seem less vague than incorrect diagnoses ("nonspecific," "not otherwise specified," "not elsewhere classified"). [Appendix G-3].

7

*Overpayments*



Fiscal Year
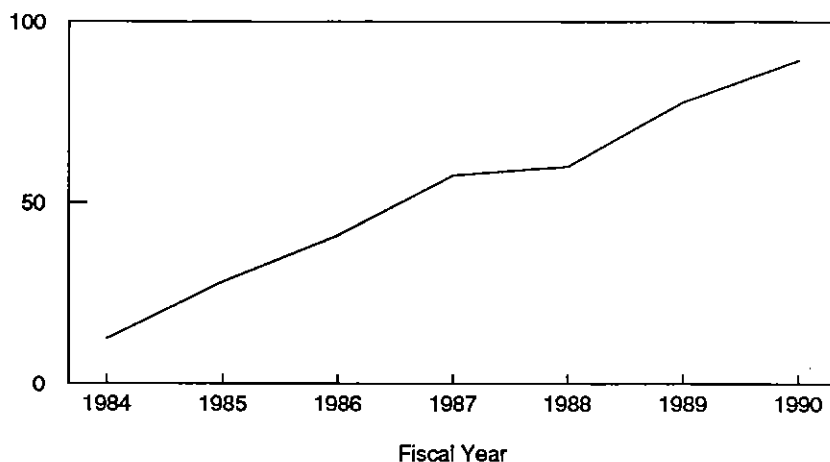
Analyzed at the level of ICD-9-CM codes, pulmonary disorders incorrectly billed as DRG 79 include bronchitis, nonspecific pneumonia, nonspecific pharyngeal disease, and foreign body lodged in the larynx. Less understandably, volume depletion, transient ischemic attack, pancreatitis, urinary tract infection, coma, and observation appear among the corrected principal diagnoses for erroneous DRG 79 bills. [Appendix G-4].

## *Clinical review results*

Only five discharges, representing 7.8 percent of cases when weighted by discharge, were judged inappropriate ("an admission in which the care received by the patient was either not needed or did not require the use of the inpatient setting"). [Appendix H-1]. This number was less than 10.0 percent reported for all DRGs. There were no cases of premature discharges. [Appendix H-2].

Of the 74 cases in the sample, 8.9 percent evidenced "quality of care not meeting professionally recognized standards." This rate significantly exceeded the 5.5 percent of the National DRG Validation Study.

*Clinical Incidence*
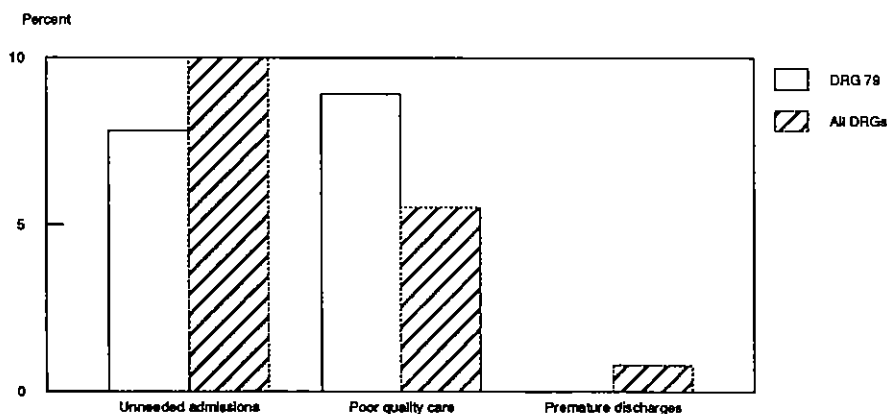
# RECOMMENDATIONS

- – The HCFA should direct the PROs to review more DRG 79 bills for coding accuracy.
- – The HCFA should direct the PROs to educate physicians and hospitals about the proper coding of DRG 79.
- – The HCFA should direct the PROs to discourage the use of unnecessarily nonspecific disease codes in bills for respiratory diseases.

The HCFA disagrees with the first recommendation and agrees with the remaining recommendations. The Office of Inspector General modified this report in light of the HCFA comments, but continues to believe that full implementation of all its recommendations would recoup a projected $89.3 million in overpayments for Fiscal Year 1990.

## Appendix A-1: DRG 79 discharges from all PPS hospitals

| Fiscal Year | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|
| Relative weight | 1.7982 | 1.7795 | 1.8488 | 1.9344 | 2.0777 |
| Number of discharges | 26,830 | 56,705 | 76,721 | 101,197 | 99,757 |
| Total charges ($ million) | 206.0 | 497.3 | 756.6 | 1,802.9 | 1,055.9 |
| Total reimbursement ($ million) | 129.0 | 291.9 | 423.0 | 591.7 | 617.7 |
| Average reimbursement ($) | 4,807 | 5,148 | 5,515 | 5,847 | 6,192 |

## Appendix A-2: DRG 79 sampling frame

| Number | Bed size | | | |
|---|---|---|---|---|
| | <100 | 100-299 | 300+ | Total |
| Medicare population | 10,434 | 22,398 | 23,873 | 56,705 |
| Sampling frame | 145 | 423 | 864 | 1432 |
| Sampled | 24 | 25 | 25 | 74 |
| Sampling fraction [%] | [16.6] | [5.9] | [2.9] | [5.2] |

## Appendix A-3: DRG 79 hospital demography

| Number [Percent] | Bed size | | | | Weighted percentage | | |
|---|---|---|---|---|---|---|---|
| | <100 | 100-299 | 300+ | Total | Sample | Discharge | Hospital |
| Urban | 6 [25.0] | 17 [68.0] | 23 [92.0] | 46 | [62.2] | [70.2] | [49.6] |
| Rural | 18 [75.0] | 8 [32.0] | 2 [ 8.0] | 28 | [37.8] | [29.8] | [50.4] |
| Teaching | 0 [ 0.0] | 9 [36.0] | 13 [52.0] | 22 | [29.7] | [36.1] | [20.0] |
| Nonteaching | 24 [ 100] | 16 [64.0] | 12 [48.0] | 52 | [70.3] | [63.9] | [80.0] |
| Profit | 4 [16.7] | 3 [12.0] | 0 [ 0.0] | 7 | [ 9.5] | [ 7.8] | [12.5] |
| Nonprofit | 20 [83.3] | 22 [88.0] | 25[100.0] | 67 | [90.5] | [92.2] | [87.5] |
| Total | 24 [100] | 25 [100] | 25 [100] | 74 | [100] | [100] | [100] |

# Appendix A-4: DRG 79 hospital demography comparison

| Percent | | Bed size | | | Weighted percentage | | |
|---|---|---|---|---|---|---|---|
| | | <100 | 100-299 | 300+ | Sample | Discharge | Hospital |
| Urban | DRG 79 | 25.0 | 68.0 | 92.0 | 62.2 | 70.2 | 49.6 |
| | NDRGVS | 19.9 | 70.2 | 94.0 | 62.0 | 71.5 | 48.0 |
| Rural | DRG 79 | 75.0 | 32.0 | 8.0 | 37.8 | 29.8 | 50.4 |
| | NDRGVS | 80.1 | 29.8 | 6.0 | 38.0 | 28.5 | 52.0 |
| Teaching | DRG 79 | 0.0 | 36.0 | 52.0 | 29.7 | 36.1 | 20.0 |
| | NDRGVS | 2.6 | 18.8 | 55.2 | 25.9 | 31.9 | 16.2 |
| Non-teaching | DRG 79 | 100 | 64.0 | 48.0 | 70.3 | 63.9 | 80.0 |
| | NDRGVS | 97.4 | 81.2 | 44.8 | 74.1 | 68.2 | 83.8 |
| Profit | DRG 79 | 16.7 | 12.0 | 0.0 | 9.5 | 7.8 | 12.5 |
| | NDRGVS | 9.2 | 17.5 | 2.5 | 9.8 | 9.4 | 10.8 |
| Non-profit | DRG 79 | 83.3 | 88.0 | 100 | 90.5 | 92.2 | 87.5 |
| | NDRGVS | 90.8 | 82.5 | 97.5 | 90.2 | 90.6 | 89.2 |

# Appendix A-5: DRG 79 patient demography

| | Bed size | | | Weighted average | | |
|---|---|---|---|---|---|---|
| | <100 | 100-299 | 300+ | Sample | Discharge | Hospital |
| Age (years) | 81.0 | 78.8 | 75.0 | 78.2 | 77.6 | 79.3 |
| Sex (% male) | 54.2 | 72.0 | 40.0 | 55.4 | 55.3 | 57.8 |
| LOS (days) | 9.5 | 10.4 | 12.3 | 10.7 | 11.0 | 10.2 |
| Payment ($) | 3544 | 5177 | 5923 | 4899 | 5191 | 4452 |
| Mortality (%) | 8.3 | 4.0 | 24.0 | 12.0 | 13.2 | 9.4 |

# Appendix A-6: DRG 79 patient demography comparison

|  |  | Bed size | | | Weighted average | | |
|---|---|---|---|---|---|---|---|
|  |  | <100 | 100-299 | 300+ | Sample | Discharge | Hospital |
| Age | DRG 79 | 81.0 | 78.8 | 75.0 | 78.2 | 77.6 | 79.3 |
| (years) | NDRGVS | 76.2 | 74.0 | 72.2 | 74.1 | 73.6 | 74.9 |
| Sex | DRG 79 | 54.2 | 72.0 | 40.0 | 55.4 | 55.3 | 57.8 |
| (% male) | NDRGVS | 43.3 | 45.4 | 48.1 | 45.7 | 46.2 | 44.8 |
| LOS | DRG 79 | 9.5 | 10.4 | 12.3 | 10.7 | 11.0 | 10.2 |
| (days) | NDRGVS | 5.9 | 7.4 | 8.3 | 7.2 | 7.5 | 6.8 |
| Payment | DRG 89 | 3544 | 5177 | 5923 | 4899 | 5191 | 4452 |
| ($) | NDRGVS | 1849 | 2923 | 3807 | 2860 | 3115 | 2508 |
| Mortality | DRG 89 | 8.3 | 4.0 | 24.0 | 12.0 | 13.2 | 9.4 |
| (%) | NDRGVS | 5.6 | 6.2 | 7.0 | 6.3 | 6.4 | 6.0 |

## Appendix B-1: DRG 79 errors

| Number [Percent] | Bed size <100 | 100-299 | 300+ | Total | Weighted percentage Sample | Discharge | Hospital |
|---|---|---|---|---|---|---|---|
| Urban | 4 [66.7] | 4 [23.5] | 2 [ 8.7] | 10 | [21.7] | [25.2] | [43.5] |
| Rural | 4 [22.2] | 1 [12.5] | 0 [ 0.0] | 5 | [17.9] | [ 9.0] | [15.5] |
| Teaching | — — | 3 [33.3] | 0 [ 0.0] | 3 | [13.6] | [13.2] | [10.9] |
| Nonteaching | 8 [33.3] | 2 [12.5] | 2 [16.7] | 12 | [23.1] | [18.1] | [23.9] |
| Profit | 2 [50.0] | 0 [ 0.0] | — — | 2 | [28.6] | [ 9.2] | [25.8] |
| Nonprofit | 6 [30.0] | 5 [22.7] | 2 [ 8.0] | 13 | [19.4] | [17.9] | [24.1] |
| Total | 8 [33.3] | 5 [20.0] | 2 [ 8.0] | 15 | [20.3] | [17.4] | [25.0] |

## Appendix B-2: DRG 79 errors comparison

| Percent | | Bed size <100 | 100-299 | 300+ | Weighted percentage Sample | Discharge | Hospital |
|---|---|---|---|---|---|---|---|
| Urban | DRG 79 | 66.7 | 23.5 | 8.7 | 21.7 | 25.2 | 43.5 |
| | NDRGVS | 22.5 | 19.3 | 16.2 | 18.0 | 17.6 | 20.4 |
| Rural | DRG 79 | 22.2 | 12.5 | 0.0 | 17.9 | 9.0 | 15.5 |
| | NDRGVS | 23.9 | 16.6 | 22.5 | 21.9 | 20.9 | 21.3 |
| Teaching | DRG 79 | — | 33.3 | 0.0 | 13.6 | 13.2 | 10.9 |
| | NDRGVS | 20.0 | 20.9 | 15.8 | 17.4 | 17.2 | 19.6 |
| Non-teaching | DRG 79 | 33.3 | 12.5 | 16.7 | 23.1 | 18.1 | 23.9 |
| | NDRGVS | 23.7 | 17.9 | 17.6 | 20.2 | 19.2 | 20.9 |
| Profit | DRG 79 | 50.0 | 0.0 | — | 28.6 | 9.2 | 25.8 |
| | NDRGVS | 23.8 | 18.9 | 18.3 | 20.3 | 19.7 | 21.3 |
| Non-profit | DRG 79 | 30.0 | 22.7 | 8.0 | 19.4 | 17.9 | 24.1 |
| | NDRGVS | 23.6 | 18.4 | 16.5 | 19.4 | 18.5 | 20.8 |
| Total | DRG 79 | 33.3 | 20.0 | 8.0 | 20.3 | 17.4 | 25.0 |
| | NDRGVS | 23.6 | 18.5 | 16.6 | 19.5 | 18.6 | 20.8 |

# Appendix B-3: DRG 79 errors by patient demography

| | | Bed size | | | Weighted average | | |
|---|---|---|---|---|---|---|---|
| | | <100 | 100-299 | 300+ | Sample | Discharge | Hospital |
| Age | Correct | 79.4 | 78.1 | 75.3 | 77.4 | 77.2 | 78.3 |
| (years) | Incorrect | 84.0 | 81.8 | 71.0 | 81.5 | 77.7 | 81.2 |
| Sex | Correct | 50.0 | 75.0 | 43.5 | 55.9 | 57.1 | 57.1 |
| (% male) | Incorrect | 62.5 | 60.0 | 0.0 | 53.3 | 35.2 | 51.8 |
| LOS | Correct | 9.5 | 11.3 | 13.0 | 11.4 | 11.7 | 10.6 |
| (days) | Incorrect | 9.4 | 7.0 | 4.5 | 7.9 | 6.4 | 7.8 |
| Payment | Correct | 3303 | 4985 | 5933 | 4899 | 5075 | 4267 |
| ($) | Incorrect | 4026 | 5941 | 5812 | 4903 | 5534 | 4933 |
| Mortality | Correct | 12.5 | 0.0 | 17.4 | 10.2 | 9.6 | 9.2 |
| (%) | Incorrect | 0.0 | 20.0 | 100.0 | 20.0 | 50.0 | 22.3 |

| Number of overpayments [Percent] | Bed size <100 | 100-299 | 300+ | Total | Weighted percentage Sample | Discharge | Hospital |
|---|---|---|---|---|---|---|---|
| Urban | 4 [100.0] | 4 [100.0] | 2 [100.0] | 10 | [100] | [100] | [100] |
| Rural | 4 [100.0] | 1 [100.0] | - — | 5 | [100] | [100] | [100] |
| Teaching | - — | 3 [100.0] | - — | 3 | [100] | [100] | [100] |
| Nonteaching | 8 [100.0] | 2 [100.0] | 2 [100.0] | 12 | [100] | [100] | [100] |
| Profit | 2 [100.0] | - — | - — | 2 | [100] | [100] | [100] |
| Nonprofit | 6 [100.0] | 5 [100.0] | 2 [100.0] | 13 | [100] | [100] | [100] |
| Total | 8 [100.0] | 5 [100.0] | 2 [100.0] | 15 | [100] | [100] | [100] |

# Appendix C-2: DRG 79 direction of errors comparison

| Percent | | Bed size <100 | 100-299 | 300+ | Weighted percentage Sample | Discharge | Hospital |
|---|---|---|---|---|---|---|---|
| Urban | DRG 79 | 100.0 | 100.0 | 100.0 | 100 | 100 | 100 |
| | NDRGVS | 53.9 | 60.4 | 57.0 | 58.0 | 57.8 | 56.5 |
| Rural | DRG 79 | 100.0 | 100.0 | — | 100 | 100 | 100 |
| | NDRGVS | 66.5 | 57.6 | 65.6 | 64.7 | 62.6 | 63.5 |
| Teaching | DRG 79 | — | 100.0 | — | 100 | 100 | 100 |
| | NDRGVS | 66.7 | 59.6 | 56.6 | 57.9 | 59.6 | 62.8 |
| Non-teaching | DRG 79 | 100.0 | 100.0 | 100.0 | 100 | 100 | 100 |
| | NDRGVS | 64.1 | 59.7 | 59.0 | 61.7 | 60.2 | 61.9 |
| Profit | DRG 79 | 100.0 | — | — | 100 | 100 | 100 |
| | NDRGVS | 68.0 | 55.7 | 63.6 | 60.7 | 61.3 | 63.3 |
| Non-profit | DRG 79 | 100.0 | 100.0 | 100.0 | 100 | 100 | 100 |
| | NDRGVS | 63.7 | 60.5 | 57.6 | 60.9 | 59.9 | 61.6 |
| Total | DRG 79 | 100.0 | 100.0 | 100.0 | 100 | 100 | 100 |
| | NDRGVS | 64.1 | 59.6 | 57.7 | 60.8 | 59.6 | 61.6 |

# Appendix C-3: DRG 79 direction of errors by patient demography

| | | Bed size | | | Weighted percentage | | |
|---|---|---|---|---|---|---|---|
| | | <100 | 100-299 | 300+ | Sample | Discharge | Hospital |
| Age (years) | Overpay | 84.0 | 81.8 | 71.0 | 81.5 | 77.7 | 81.2 |
| | Underpay | — | — | — | — | | |
| Sex (% male) | Overpay | 62.5 | 60.0 | 0.0 | 53.3 | 35.2 | 51.8 |
| | Underpay | — | — | — | — | | |
| LOS (days) | Overpay | 9.4 | 7.0 | 4.5 | 7.9 | 6.4 | 7.8 |
| | Underpay | — | — | — | — | | |
| Payment ($) | Overpay | 4026 | 5941 | 5812 | 4903 | 5534 | 4933 |
| | Underpay | — | — | — | — | | |
| Mortality (%) | Overpay | 0.0 | 20.0 | 100.0 | 20.0 | 50.0 | 22.3 |
| | Underpay | — | — | — | — | | |

# Appendix D-1: DRG 79 hospital department making error

| Coding department errors [Percent] | Bed size | | | Total | Weighted percentage | | |
|---|---|---|---|---|---|---|---|
| | <100 | 100-299 | 300+ | | Sample | Discharge | Hospital |
| Urban | 3 [75.0] | 4 [100.0] | 2 [100.0] | 9 | [90.0] | [95.4] | [87.1] |
| Rural | 3 [75.0] | 1 [100.0] | - — | 4 | [80.0] | [53.3] | [71.3] |
| Teaching | - — | 3 [100.0] | - — | 3 | [100.0] | [39.5] | [32.6] |
| Nonteaching | 6 [75.0] | 2 [100.0] | 2 [100.0] | 10 | [83.3] | [95.4] | [87.1] |
| Profit | 1 [50.0] | - — | - — | 1 | [50.0] | [9.2] | [25.8] |
| Nonprofit | 5 [83.3] | 5 [100.0] | 2 [100.0] | 12 | [92.3] | [96.9] | [91.4] |
| Total | 6 [75.0] | 5 [100.0] | 2 [100.0] | 13 | [86.7] | [95.4] | [87.1] |

Balance of errors made by hospital billing department.

# Appendix D-2: DRG 79 hospital department making error comparison

| Percent of errors by coding department | | Bed size | | | Weighted percentage | | |
|---|---|---|---|---|---|---|---|
| | | <100 | 100-299 | 300+ | Sample | Discharge | Hospital |
| Urban | DRG 79 | 75.0 | 100.0 | 100.0 | 90.0 | 95.4 | 87.1 |
| | NDRGVS | 89.2 | 88.8 | 90.6 | 89.7 | 89.7 | 89.3 |
| Rural | DRG 79 | 75.0 | 100.0 | — | 80.0 | 53.3 | 71.3 |
| | NDRGVS | 94.5 | 95.8 | 90.6 | 94.5 | 93.3 | 94.3 |
| Teaching | DRG 79 | — | 100.0 | — | 100 | 39.5 | 32.6 |
| | NDRGVS | 91.7 | 92.6 | 89.2 | 90.3 | 91.0 | 91.6 |
| Non-teaching | DRG 79 | 75.0 | 100.0 | 100.0 | 83.3 | 95.4 | 87.1 |
| | NDRGVS | 93.5 | 90.2 | 92.3 | 92.2 | 91.8 | 92.2 |
| Profit | DRG 79 | 50.0 | — | — | 50.0 | 9.2 | 25.8 |
| | NDRGVS | 86.0 | 92.4 | 81.8 | 89.3 | 86.5 | 87.4 |
| Nonprofit | DRG 79 | 83.3 | 100.0 | 100.0 | 92.3 | 96.9 | 91.4 |
| | NDRGVS | 94.3 | 90.3 | 90.9 | 92.1 | 91.4 | 92.5 |
| Total | DRG 79 | 75.0 | 100.0 | 100.0 | 86.7 | 95.4 | 87.1 |
| | NDRGVS | 93.5 | 90.7 | 90.6 | 91.7 | 91.2 | 92.1 |

# Appendix D-3: DRG 79 hospital department making error by patient demography

|  |  | Bed size | | | Weighted average | | |
|---|---|---|---|---|---|---|---|
|  |  | <100 | 100-299 | 300+ | Sample | Discharge | Hospital |
| Age | Coding | 82.3 | 81.8 | 71.0 | 80.4 | 77.3 | 80.4 |
| (years) | Billing | 89.0 | — | — | 89.0 | 16.4 | 45.9 |
| Sex | Coding | 50.0 | 60.0 | 0.0 | 46.2 | 32.9 | 45.4 |
| (% male) | Billing | 100.0 | — | — | 100 | 18.4 | 51.6 |
| LOS | Coding | 9.7 | 7.0 | 4.5 | 7.8 | 6.4 | 8.0 |
| (days) | Billing | 8.5 | — | — | 8.5 | 1.6 | 4.4 |
| Payment | Coding | 4061 | 5941 | 5812 | 5054 | 5541 | 4951 |
| ($) | Billing | 3921 | — | — | 3921 | 722 | 2023 |
| Mortality | Coding | 0.0 | 20.0 | 100.0 | 40.0 | 50.0 | 22.3 |
| (%) | Billing | 0.0 | — | — | 0.0 | 0.0 | 0.0 |

## Appendix E-1: DRG 79 reasons for errors

| Number | Bed size | | | Total | [Percent] |
|---|---|---|---|---|---|
| | <100 | 100-299 | 300+ | | |
| Mis-specification | 3 | 1 | 2 | 6 | [40.0] |
| Miscoding | 1 | 1 | 0 | 2 | [13.3] |
| Resequencing | 1 | 2 | 0 | 3 | [20.0] |
| Other | 3 | 1 | 0 | 4 | [26.7] |
| Total | 8 | 5 | 2 | 15 | [100.0] |

## Appendix E-2: DRG 79 reasons for errors by hospital demography

| Number [Percent] | Mis-specification | Miscoding | Resequencing | Other | Total |
|---|---|---|---|---|---|
| <100 beds | 3 [ 37.5] | 1 [12.5] | 1 [12.5] | 3 [37.5] | 8 [100.0] |
| 100-299 beds | 1 [ 20.0] | 1 [20.0] | 2 [40.0] | 3 [20.0] | 5 [100.0] |
| 300+ beds | 2 [100.0] | 0 [ 0.0] | 0 [ 0.0] | 0 [ 0.0] | 2 [100.0] |
| Urban | 4 [ 40.0] | 1 [10.0] | 3 [30.0] | 2 [20.0] | 10 [100.0] |
| Rural | 2 [ 40.0] | 1 [20.0] | 0 [0.0] | 2 [40.0] | 5 [100.0] |
| Teaching | 1 [ 33.3] | 0 [ 0.0] | 2 [66.7] | 0 [ 0.0] | 3 [100.0] |
| Nonteaching | 5 [ 41.7] | 2 [16.7] | 1 [8.3] | 4 [33.3] | 12 [100.0] |
| Profit | 0 [ 0.0] | 0 [ 0.0] | 1 [50.0] | 1 [50.0] | 2 [100.0] |
| Nonprofit | 6 [ 46.2] | 2 [15.4] | 2 [15.4] | 3 [23.1] | 13 [100.0] |
| Total | 6 [ 40.0] | 2 [13.3] | 3 [20.0] | 4 [26.7] | 15 [100.0] |

## Appendix E-3: DRG 79 reasons for errors comparison

| Percent distribution | | Bed size | | | Weighted percentage | | |
|---|---|---|---|---|---|---|---|
| | | <100 | 100-299 | 300+ | Sample | Discharge | Hospital |
| Mis-specification | DRG 79 | 37.5 | 20.0 | 100.0 | 58.9 | 56.9 | 44.5 |
| | NDRGVS | 49.8 | 44.9 | 49.4 | 48.1 | 47.9 | 48.1 |
| Miscoding | DRG 79 | 12.5 | 20.0 | 0.0 | 9.8 | 8.3 | 13.9 |
| | NDRGVS | 10.4 | 14.3 | 11.4 | 11.9 | 12.2 | 11.8 |
| Resequencing | DRG 79 | 12.5 | 40.0 | 0.0 | 17.3 | 18.1 | 20.4 |
| | NDRGVS | 31.0 | 24.9 | 24.3 | 27.1 | 25.9 | 28.0 |
| Other | DRG 79 | 37.5 | 20.0 | 0.0 | 8.8 | 14.8 | 21.3 |
| | NDRGVS | 6.7 | 15.9 | 14.9 | 12.8 | 13.5 | 11.0 |

## Appendix E-4: DRG 79 reasons for errors by patient demography

| | Mis-specification | Miscoding | Resequencing | Other |
|---|---|---|---|---|
| Age (years) | 77.0 | 84.0 | 89.3 | 83.0 |
| Sex (% male) | 50.0 | 100.0 | 33.3 | 66.7 |
| LOS (days) | 8.0 | 5.0 | 6.7 | 8.3 |
| Payment ($) | 4956 | 3926 | 6126 | 3823 |
| Mortality (%) | 33.3 | 50.0 | 0.0 | 0.0 |

## Appendix F-1: DRG 79 corrected relative weights

| Relative weight | Bed size | | | Average- |
|---|---|---|---|---|
| | <100 | 100-299 | 300+ | Total |
| Average | | | | |
| Paid | 1.7795 | 1.7795 | 1.7795 | 1.7795 |
| Correct | 1.4834 | 1.5709 | 1.6933 | 1.5839 |
| Difference | 0.2961 | 0.2086 | 0.0862 | 0.1956 |
| Total | | | | |
| Paid | 42.7080 | 44.4875 | 44.4875 | 131.6830 |
| Correct | 35.6016 | 39.2725 | 44.3325 | 117.2086 |
| Difference | 7.1064 | 5.2150 | 2.1550 | 14.4744 |

## Appendix F-2: DRG 79 corrected reimbursement

| $ | Bed size | | | Average- |
|---|---|---|---|---|
| | <100 | 100-299 | 300+ | Total |
| Average | | | | |
| Paid | 4,506 | 4,755 | 5,226 | 4,906 |
| Correct | 3,756 | 4198 | 4,973 | 4,366 |
| Difference | 750 | 557 | 253 | 539 |
| Total | | | | |
| Paid | 108,137 | 118,885 | 125,420 | 363,009 |
| Correct | 90,143 | 104,949 | 119,344 | 323,108 |
| Difference | 17,993 | 13,936 | 6,075 | 39,901 |
| Overpayment rate [%] | 16.6 | 11.7 | 4.8 | 9.7[*] |

* Discharge weighted.

## Appendix F-3: DRG 79 estimated cost of errors

| Fiscal Year | Reimbursement ($ million) | Overpayment ($ million) |
|---|---|---|
| 1984 | 129.0 | 12.5 |
| 1985 | 291.9 | 28.3 |
| 1986 | 423.0 | 41.0 |
| 1987 | 591.7 | 57.4 |
| 1988 | 617.7 | 59.9 |
| 1989 est. | 793.5 | 77.0 |
| 1990 est. | 921.1 | 89.3 |

Overpayment calculated as 9.7 percent of reimbursement.
Estimates based on linear regression.

## Appendix G-1: Correct MDC for discharges miscoded to DRG 79

| Number | | Bed size | | | Total | [Percent] |
|---|---|---|---|---|---|---|
| | | <100 | 100-299 | 300+ | | |
| 01: | Nervous system | 2 | 0 | 0 | 2 | [13.3] |
| 03: | Ear, nose, & throat | 1 | 1 | 1 | 3 | [20.0] |
| 04: | Respiratory | 4 | 1 | 0 | 5 | [33.3] |
| 06: | Digestive | 0 | 1 | 0 | 1 | [ 6.7] |
| 07: | Pancreas and liver | 0 | 1 | 0 | 1 | [ 6.7] |
| 10: | Endocrine and metabolic | 0 | 0 | 1 | 1 | [ 6.7] |
| 11: | Kidney and urinary tract | 0 | 1 | 0 | 1 | [ 6.7] |
| 23: | After care | 1 | 0 | 0 | 1 | [ 6.7] |
| | Total | 8 | 5 | 2 | 15 | [100.0] |

## Appendix G-2: Correct DRG for discharges miscoded to DRG 79

| Number | | Bed size | | | Total | [Percent] |
|---|---|---|---|---|---|---|
| | | <100 | 100-299 | 300+ | | |
| 73: | Other ear, nose, throat | 1 | 1 | 1 | 3 | [20.0] |
| 89: | Simple pneumonia | 2 | 0 | 0 | 2 | [13.3] |
| 96: | Bronchitis, asthma | 1 | 1 | 0 | 2 | [13.3] |
| | Other | 4 | 3 | 1 | 8 | [53.3] |
| | Total | 8 | 5 | 2 | 15 | [100.0] |

## Appendix G-3: Principal diagnoses correctly billed as DRG 79

| Disorder | Number | [Percent] |
|---|---|---|
| Suspected tuberculosis | 1 | [ 1.7] |
| Tuberculosis not otherwise specified | 4 | [ 6.8] |
| Klebsiella pneumonia | 11 | [18.6] |
| Pseudomonas pneumonia | 10 | [16.9] |
| Staphylococcal pneumonia | 10 | [16.9] |
| Aspiration pneumonitis | 19 | [32.2] |
| Empyema | 3 | [ 5.1] |
| Lung abscess | 1 | [ 1.7] |
| Total | 59 | [100.0] |

## Appendix G-4: Principal diagnoses incorrectly billed as DRG 79

| Disorder | Number | [Percent] |
|---|---|---|
| Volume depletion | 1 | [ 6.7] |
| Transient ischemic attack | 1 | [ 6.7] |
| Acute bronchitis | 2 | [ 13.3] |
| Pharynx not otherwise specified | 1 | [ 6.7] |
| Pneumonia not otherwise specified | 2 | [ 13.3] |
| Esophageal stricture | 1 | [ 6.7] |
| Acute pancreatitis | 1 | [ 6.7] |
| Urinary tract infection | 1 | [ 6.7] |
| Coma | 1 | [ 6.7] |
| Foreign body in larynx | 3 | [ 20.0] |
| Observation | 1 | [ 6.7] |
| Total | 15 | [100.0] |

## Appendix H-1: DRG 79 clinical review

| Number [Percent] | Bed size | | | Total | Weighted average | | |
|---|---|---|---|---|---|---|---|
| | <100 | 100-299 | 300+ | | Sample | Discharge | Hospital |
| Unnecessary admissions | 1 [4.2] | 0 [0.0] | 4 [16.6] | 5 | [6.8] | [7.8] | [4.8] |
| Poor quality care | 1 [4.2] | 3 [12.0] | 2 [8.0] | 6 | [8.1] | [8.9] | [7.3] |
| Premature discharge | 0 [0.0] | 0 [0.0] | 0 [0.0] | 0 | [0.0] | [0.0] | [0.0] |

## Appendix H-2: DRG 79 clinical review comparison

| Percent | | Bed size | | | Weighted percentage | | |
|---|---|---|---|---|---|---|---|
| | | <100 | 100-299 | 300+ | Sample | Discharge | Hospital |
| Unnecessary admissions | DRG 79 | 4.2 | 0.0 | 16.6 | 6.8 | 7.8 | 4.8 |
| | NDRGVS | 12.6 | 10.1 | 8.9 | 10.5 | 10.0 | 11.3 |
| Poor quality care | DRG 79 | 4.2 | 12.0 | 8.0 | 8.1 | 8.9 | 7.3 |
| | NDRGVS | 11.4 | 5.1 | 3.5 | 6.6 | 5.5 | 8.1 |
| Premature discharge | DRG 79 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | NDRGVS | 2.1 | 0.8 | 0.4 | 1.1 | 0.8 | 1.4 |