Have Medicaid Reimbursements Been a Credible Measure of the Cost of Pediatric Care?

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ABSTRACT. *Objective.* **Despite uncertain validity as a measure of cost, Medicaid reimbursements may be used to compare the costs of different pediatric interventions. We explored the credibility of Medicaid reimbursements as a measure of the costs of inpatient care associated with two different approaches to follow-up care for high-risk indigent infants.**

Design. **Analysis of Medicaid reimbursements within a randomized trial of primary follow-up care.**

Patients. **Infants 1500 g at birth in a large county hospital (Parkland Memorial Hospital).**

Intervention. **Conventional care after nursery discharge (with well-baby care and care for chronic illnesses provided in our follow-up clinic) or primary care (with care for acute illnesses also provided in the follow-up clinic). Measures to prevent a lapse in Medicaid coverage were included in all clinic visits.**

Outcome Measures. **The completeness, comparability, and plausibility of Medicaid reimbursements for inpatient care of the two groups between nursery discharge and 1 year adjusted age.**

Results. **A high percentage (90% to 91%) of both groups were enrolled in Medicaid. However, with fewer clinic visits in the conventional care group, Medicaid coverage often lapsed in this group, particularly among the highest risk infants. As a result, the proportion of hospital days reimbursed by Medicaid was substantially lower for conventional care than primary care infants (53% [92/174] vs 96% [298/310]). An even larger disparity was observed for pediatric intensive care days (10% [6/61] vs 100% [33/33]). Implausible Medicaid reimbursements included a lower reimbursement rate per day in the pediatric intensive care unit than on the pediatric floor (1 infant), a lower reimbursement rate per day for hospital care than home care (1 infant), and a mean reimbursement rate per day for our private pediatric teaching hospital ($1244/day) that did not exceed that for the private nonteaching pediatric hospital ($1268/day). The reimbursement rate for our public teaching hospital was particularly low ($507/day) despite a high acuity of illness (21% of hospital days in the pediatric intensive care unit).**

Conclusions. **Without proper validation, reimbursements from Medicaid (or any program that replaces it) should not be assumed to provide an unbiased or acceptably accurate measure of the relative or absolute cost of pediatric health care interventions.** *Pediatrics* **1997;99(3). URL: http://www.pediatrics.org/cgi/content/full/99/3/e8;** ***primary care, follow-up care, cost, Medicaid, economic analysis, health care delivery.***

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ABBREVIATIONS. PICU, pediatric intensive care unit; BW, birth weight.

Informed decisions in allocating limited resources for health care require an understanding of not only the health effects but also the resource costs of different health care interventions.[1] Unfortunately, the assessment of these costs has proved to be a very difficult problem.[1]

Resource costs can be accurately evaluated by an intensive direct assessment.[2] However, such an assessment is a very demanding and expensive process that has rarely been used.[3] Hospital charges have often been used as a proxy for costs.[4–8] However, traditional hospital accounting systems were not designed to reflect resource costs but to assure collection of revenues.[1] The charge for a specific service has no necessary or predictable relationship to the actual cost to provide the service[1,9] (see "Discussion"). For this reason, the use of charge data may lead to erroneous conclusions about the cost-effectiveness of different health care interventions.[10]

An alternative approach is to use Medicaid or Medicare reimbursements[11] under the assumption that the approved reimbursements for different interventions are a reasonably accurate indicator of their absolute and relative resource costs. Medicare reimbursements have often been used although they "require much evaluation and 'massaging'" before they can be properly used.[12] Medicaid data are more limited than Medicare data in terms of completeness, continuity, and uniformity. Yet, data for Medicaid (or any similar program that replaces Medicaid) may be the only financial data available for large numbers of pediatric patients in the United States.

In this article we present a pilot study performed to assess the credibility of Medicaid reimbursements as a measure of the hospital costs associated with two different approaches to the care of indigent high-risk infants. This pilot study was performed within an ongoing randomized trial of conventional and primary follow-up care for inner-city survivors of newborn intensive care.

METHODS

Purpose of Clinical Trial

The trial is being conducted to test the hypothesis that primary follow-up care reduces life-threatening illnesses—defined as ill-

nesses resulting in death or admission to a pediatric intensive care unit (PICU)—in a high-risk population. To prevent mild or moderate illnesses from progressing to life-threatening illnesses, primary care is expected to increase costs for clinic visits and perhaps hospital days on the pediatric floor. However, these increases may be totally or largely offset by a reduced cost for hospital days in the PICU.

Population

Infants born at Parkland Memorial Hospital, the county hospital for Dallas, Texas, and the primary teaching hospital in our medical center, are eligible for the trial if their birth weight (BW) is less than 1000 g or if their BW is 1001 to 1500 g and they require mechanical ventilation during the first 2 days after birth. We have previously shown that such infants have high mortality, morbidity, and care needs throughout infancy.[13] Ninety-eight percent of the infants have been eligible for Medicaid coverage.

The analyses that we report involve infants born between May 1, 1991 and March 30, 1992. This period was selected because complete Medicaid data through 12 months adjusted age (1 year past term) could be obtained for each Medicaid-eligible infant. This study period includes sufficient infants (n = 83) to analyze Medicaid reimbursements for a sizable total number of days in the hospital (578) and in a PICU (94).

Patient Care

Infants randomized to the conventional care group receive care for chronic illnesses in addition to well-baby care, anticipatory guidance, and developmental testing in our follow-up clinic at Children's Medical Center, a private pediatric teaching hospital adjacent to Parkland. This care is provided two mornings per week by a multidisciplinary team. Care for acute illnesses is provided in clinics in the community or in other clinics or the emergency room in our center.

Infants randomized to the primary care group receive care for acute illnesses in our follow-up clinic. These infants have access to their primary care provider 40 hours per week within the clinic and by telephone at all other hours. Emphasis is placed on providing prompt medical attention whenever acute illnesses develop. These infants also receive the services provided in the follow-up clinic to the conventional care group.

The contact between our follow-up staff and study families between nursery discharge and 1 year adjusted age has been greater for the primary care group than the conventional care group with respect to the mean number of clinic visits (9.3 vs 6.8 visits) and particularly the number of phone calls (8.0 vs .6 calls). Loss to follow-up in our clinic at 1 year has been less in the primary care group (9% vs 35%). (Outcome data to date are encouraging but await evaluation at the completion of the trial).

Enrollment in Medicaid

If such coverage was not arranged in the prenatal clinics, an application is initiated before the mother's discharge from the hospital. At each clinic visit or hospitalization of the infant, a financial counselor assists in securing Medicaid coverage that has lapsed or was not obtained.

Identification of Medical Services and Medicaid Reimbursements

An evaluator blinded to the group assignment reviews all clinic and hospital charts at Parkland and Children's Medical Center. Our infants routinely receive care only in these hospitals. However, we used maternal reports and Texas Medicaid data to identify all hospitalizations. All records for services billed to Medicaid between nursery discharge and 12 months adjusted age for infants in this analysis were provided by National Heritage Insurance Company, the private corporation responsible for processing Texas Medicaid claims. The interval between the last day of the hospitalization and the tabulation of Medicaid payments allowed no less than 9 months to process all Medicaid claims for all infants in both groups. The same procedure to identify reimbursements was used for both groups, and the personnel at the National Heritage Insurance Company were not aware of treatment group.

Criteria for Assessing Medicaid Reimbursements

We assessed reimbursements for inpatient care because the costs for such care are likely to be the predominant medical cost for both groups.

Comparability and Completeness of Medicaid Coverage for the Two Groups

Under Texas law, periodic recertification is required for continued Medicaid coverage. Because of differences in clinic attendance, coverage would be expected to lapse less often among primary care infants than conventional care infants, particularly among the highest risk infants. We assessed the study groups with respect to the percent of infants covered at any time during the first year, percent of infant-months covered, percent of hospital days covered, and percent of PICU days covered. For each of these variables, we considered a Medicaid coverage rate of less than 90% to be inadequate to assess hospital costs.

Comparability and Completeness of Medicaid Reimbursements for the Two Groups

Reimbursements may not be provided for infants with Medicaid coverage, largely because the claim is not submitted (or appealed) by the hospital within the allowable time. Delayed submission is most likely when recertification is required. For reasons noted above, primary care infants may be less likely than conventional care infants to need recertification. We compared the two groups with respect to the percent of hospital days and PICU days for which any Medicaid reimbursements were received. We considered Medicaid reimbursement to be an inadequate measure of cost if reimbursement were received for fewer than 90% of hospital days. We made no attempt to assess whether all appropriate reimbursements were provided. Thus, our analysis provides a liberal assessment of the completeness of Medicaid reimbursements in each group.

Plausibility of Medicaid Reimbursement Data as a Measure of Cost

Implausible findings include a) an equal or lower reimbursement rate per day for intensive care than for a lower level of care in the same hospital or at home, and b) an equal or lower reimbursement rate per day for teaching hospitals than for nonteaching hospitals. With the costs involved in training physicians, higher mean costs are expected in teaching hospitals,[14–17] particularly if, as in our region, the teaching hospitals are responsible for providing pediatric intensive care to indigent patients. The mean Medicaid reimbursement per day for a specific hospitalization was computed by dividing the total reimbursement by the total hospital stay. The overall mean was calculated as the average of the means for all hospitalizations for which Medicaid reimbursements were provided. The charges submitted to Medicaid as well as the reimbursements were assessed in a similar fashion. Hospitalizations outside of Texas were not considered in comparing charges or reimbursements for Parkland and Children's with those for private nonteaching hospitals.

Statistical Analysis

Two-tailed Fisher's exact tests were used to assess differences between groups in proportions (of infants, infant-months, hospital days, or PICU days with Medicaid coverage or reimbursement). Statistical analyses were considered inappropriate or unnecessary in identifying findings that are implausible if Medicaid reimbursements indicate true resource costs (eg, a lower reimbursement rate for PICU care than for home care of the same infant; the absence of a higher mean reimbursement rate for a private teaching hospital than a private nonteaching hospital). All statistical tests were performed using Stata software, Release 3.1 (Stata Corporation, College Station, TX). P values less than .05 were considered statistically significant.

RESULTS

The study period assessed in this report allowed us to assess hospitalizations to 1 year adjusted age for 43 infants in the primary care group and 40 infants in the conventional care group. The infants in

the primary care and conventional care groups were similar with respect to neonatal findings, including median BW (1050 g vs 1105 g), need for mechanical ventilation (98% vs 100%), and mean nursery stay (68.1 vs 67.8 days), respectively. Using hospital charts, maternal reports, and Medicaid data, we identified 343 hospital days (33 in the PICU) as a result of 32 admissions (5 to the PICU) among the primary care group. The conventional care group had 235 identified hospital days (61 in the PICU) as a result of 23 admissions (6 to the PICU).

Completeness and Comparability of Medicaid Coverage

Given the effort to enroll infants in Medicaid before nursery discharge, 91% (39/43) of the primary care group and 90% (36/40) of the conventional care group were enrolled during infancy. However, with the recertification requirements, Medicaid coverage lapsed less in the primary care than in the conventional care group (3/39 vs 10/36; $P = .03$). Coverage was particularly likely to lapse among the highest risk infants in the conventional care group. As a result, Medicaid coverage in the conventional care group was less than 90% and lower than the primary care group when expressed as the percent of infant-months covered, the percent of hospital days covered, and especially the percent of PICU days covered ($P < .05$ for all comparisons) (Fig 1).

Completeness and Comparability of Medicaid Reimbursements

Reimbursements (of any amount) were provided for considerably fewer than 90% of hospital days and PICU days for the conventional care group. Such reimbursements were provided for only 53% of hospital days and 10% of PICU days among the conventional care group, compared with 96% and 100%, respectively, for the primary care group ($P < .01$) (Fig 2).

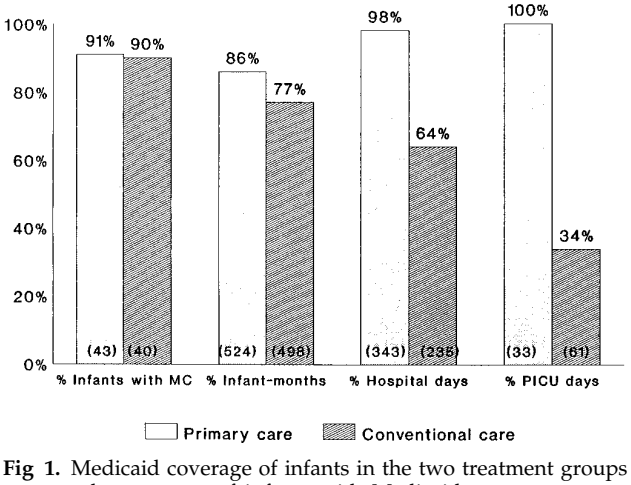

Fig 1. Medicaid coverage of infants in the two treatment groups expressed as percent of infants with Medicaid coverage at any time during the study, percent of infant-months covered, percent of hospital days, and percent of pediatric intensive care unit days covered. Total number of infants, infant-months, and days presented in parentheses.

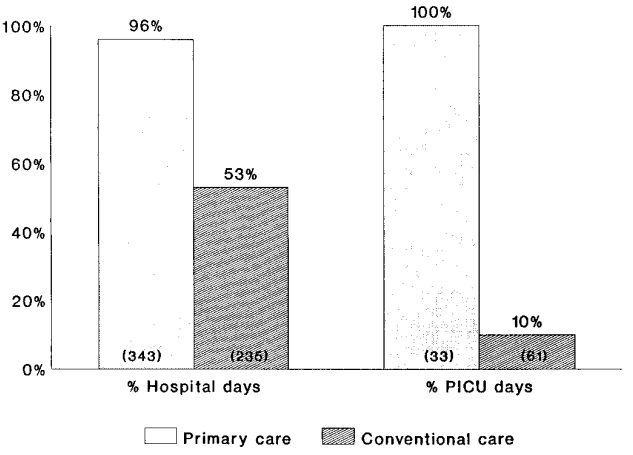

Fig 2. Hospital and pediatric intensive care unit days for which any Medicaid reimbursements were received as a percent of all hospital and pediatric intensive care unit days (in parentheses).

Implausible Medicaid Reimbursement Data

For one primary care patient, the Medicaid reimbursement rate per day was higher on the general pediatric floor than in the PICU in the same hospital ($1039/day vs $661/day). For another primary care patient, the daily Medicaid reimbursement per day was higher for home health care than for the PICU ($1465/day vs $1206/day).

The mean reimbursement per day for our county hospital (Parkland) was less than half that for either our private pediatric teaching hospital (Children's) or the private nonteaching hospital (Fig 3). This difference was observed even though the proportion of Medicaid covered hospital days in a PICU was substantially greater at Parkland (32/151; 21%) than at Children's (5/188; 2.7%) or the private pediatric nonteaching hospital (0/101).

Contrary to that expected if reimbursements were an accurate measure of resource costs, Medicaid reimbursements per day for our private pediatric

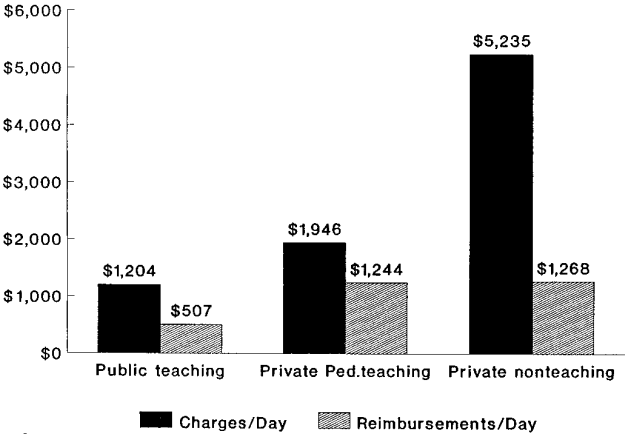

Fig 3. Mean Medicaid charges and reimbursements within Texas by hospital type for infants with Medicaid coverage. Data represents 16 admissions for 151 days in the public teaching hospital, 23 admissions for 188 days in the private pediatric teaching hospital, and two admissions for 101 days in the private nonteaching hospital. (Standard deviations for hospital charges were 654, 953, and 1538; standard deviations for hospital reimbursement were 290, 458, and 351, respectively).

teaching hospital did not exceed that for the private nonteaching pediatric hospital for our patients.

DISCUSSION

A high and virtually identical proportion (90% to 91%) of infants in our two study groups were enrolled in Medicaid. Efforts to assure continued Medicaid coverage were made at each clinic visit and hospitalization. Even in the conventional care group, the mean number of visits (6.8) met or exceeded the goal for infants in the great majority of follow-up programs or well-baby clinics. Yet, Medicaid reimbursements were provided for only 53% of hospital days and 10% of PICU days among the conventional care group. The corresponding percentages for infants in the primary care group were 96% and 100%, respectively.

The problem of incomplete Medicaid coverage might be addressed by using the reimbursements provided for services to patients covered by Medicaid to estimate the costs for patients without Medicaid. Without undertaking a highly intensive direct assessment of costs,[1,3] there is no way to calculate the difference between Medicaid reimbursements and a gold-standard measure of true costs. Nevertheless, the marked differences between primary and conventional care groups in percent of hospital days and PICU days reimbursed by Medicaid indicate that these reimbursements would provide a highly biased assessment of the hospital costs associated with these two programs.

The diagnosis-related group system was devised largely to reduce Medicare and Medicaid payments for hospital care rather than to reimburse hospitals for their true costs. Thus, Medicaid reimbursements might not be expected to have a strong and consistent relationship to hospital costs. Other investigators have published evidence that Medicaid reimbursements for pediatric services are often less than their absolute costs.[1,18–20] The validity of Medicaid reimbursements even as a measure of relative costs is also called into question by implausible findings in our study, eg, the identification of higher reimbursement per day for home care than for PICU care for one patient. The reimbursement rate for public and private hospitals and for teaching and nonteaching hospitals can also be questioned as a measure of the differences in their true costs. Despite greater acuity of illness and a considerably larger proportion of hospital days devoted to pediatric intensive care, our public hospital was reimbursed at less than half the rate of private hospitals. Moreover, our analysis of private pediatric hospitals identified no evidence that teaching hospitals are reimbursed at a higher rate than nonteaching hospitals. These findings may relate more to the way that hospitals submit claims and secure reimbursements than to the true resource costs of care.

Some investigators have estimated resource costs by multiplying hospital charges by a cost-to-charge ratio reported in the hospital's Medicare cost report.[20] However, the ratio of true resource costs to charges within the same hospital is likely to vary for different services and may differ for different kinds of patients, for outpatient and inpatient care, and for intensive care and other inpatient care.[1,9] Thus, the use of a single cost-to-charge ratio may produce misleading results in assessing the cost-effectiveness of a medical intervention that changes the type of care given (eg, primary care that may reduce intensive care while increasing outpatient care).

To avoid this problem, other investigators[21–23] have estimated costs by multiplying hospital charges for specific services by the cost-to-charge ratio designated by the hospital for the department that provided the service. We are currently evaluating this approach for assessing the cost of conventional and primary care. This may be the best method that can be broadly applied to estimate costs in different hospitals in the United States. However, a limitation of such cost-to-charge ratios is that they reflect accounting costs rather than economic costs due to resource consumption. As discussed by Finkler,[1] accounting costs are based in part on the hospital's strategies to assign costs expeditiously and to increase revenues.

Ongoing changes in health care financing (eg, reimbursement according to diagnosis-related group or by capitation) are making it increasingly necessary for health care institutions to accurately measure and understand their true costs. Yet, progress has been slow in refining hospital accounting systems. Despite the intense pressure to control health care costs in the United States,[24] the methods generally used to assess these costs remain crude. Because of the inherent complexity of hospitals and medical services, a standardized, uniform cost accounting system that would permit valid comparisons of the resource costs for different health care interventions, programs, or hospitals is not likely to be available soon.

Until such accounting systems are available, investigators may attempt to estimate the costs of pediatric care using data from the Medicaid program or any program that replaces Medicaid. Reimbursements provided in other states may be more complete and a better measure of cost than in Texas.[25] However, without proper validation, reimbursements received from any source should not be assumed to be an unbiased or acceptably accurate measure of the absolute or relative resource costs of different health care interventions.

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