Cost Analysis of Prenatal Care Using the Activity-Based Costing Model: A Pilot Study

Theresa Gesse, CNM, Ph.D.
Susan Golembeski, MSN
Jonell Potter, MSN

THERESA GESSE is an Associate Professor in the School of Nursing at the University of Miami in Coral Gables, Florida. SUSAN GOLEMBESKI and JONELL POTTER are Doctoral Candidates in the School of Nursing at the University of Miami in Coral Gables, Florida.

Abstract

The cost of prenatal care in a private nurse-midwifery practice was examined using the activity-based costing system. Findings suggest that the activities of the nurse-midwife (the health care provider) constitute the major cost driver of this practice and that the model of care and associated, time-related activities influence the cost. This pilot study information will be used in the development of a comparative study of prenatal care, client education, and self care.

Journal of Perinatal Education, 8(2), 20-27; cost, prenatal care, nurse-midwifery.

In an era of managed care, the personalization of women's and perinatal services, education, and the promotion of wellness are jeopardized in high-volume settings where the corporate owner is focused on the number of visits per day as the criteria for successful practice. This situation has come about in the context of spiraling cost of health care in the United States for the past two decades. From 1970 to 1987, national health care spending increased by an average of 12.7% (Kovner, 1990). By 1994, health care expenditures accounted for an estimated 15% of the gross domestic product (Bodenheimer & Grumbach, 1995). Some of the many factors associated with cost increases are population growth, rapidly expanding medical technology which consequently increases medical care services, a crisis within the insurance industry, and a changing social structure. Thus, as we approach the end of this century, a determined need for financial restructuring and cost containment of health care has moved the country into an era

of health care reform. The traditional "fee for service" model through out-of-pocket or third party reimbursement and public services for individuals and families without means of payment are being replaced by the concept of "managed care." This is defined as "the integration of both the financing and delivery of health care within a system that seeks to manage the accessibility, cost, and quality of care" (Academy of Health Care Management [AHM], 1997, p. 1). Attempts to introduce new models of health care, such as national health insurance, can be traced over a 50-year span (Germano & Berstein, 1997; Starr, 1982; Stone, 1997). Yet, it has taken the uncontrolled cost of health care to bring about the reluctant acceptance of a new paradigm. Managed care is taking hold across the country with uneven speed and boundaries. Hospitals, nursing homes, home health agencies, and private practices are being acquired by managed care corporations and are generating growth of a corporate model of medical care.

This movement has been received with mixed reviews in the health care arena, but it is not the focus of this paper to discuss its efficacy. What is of importance here is the acknowledgment that managed care has produced more regulation of the pace and routine of work. Standards of performance focus on generation of revenue, volume of patients seen, monitoring the utilization of medical technology, and use of specialist consultation and referral, all of which are intended to improve service while controlling costs. Whether such improvement is actually occurring is widely debated. There are multiple constraints placed on the health care provider, as well as the consumer of care, regarding provider choice, consultation and referral decisions, hospital admission, and affordable time given to services.

Background of the Study

The affordable time factor is of particular concern to nurse-midwives and nurse practitioners whose hallmark of practice centers on the time given to a patient. The need for efficient productivity that includes personalizing services, education, and promotion of wellness is recognized. McGlynn (1998), who examined the effects of managed care on primary health care services for women, addressed the complexity of managed care structures and the challenges presented in meeting diverse health care needs of the female across the life

span in such a system. One might add another challenge: maintaining the vital component of health education, especially in preconception and pregnancy services, at an acceptable and reimbursable health care cost.

. . . another challenge is that of maintaining the vital component of health education, especially in preconception and pregnancy services, at an acceptable and reimbursable health care cost.

This cost analysis of prenatal care pilot study is one of several pilots being conducted by the researchers to collect data in preparation for a comparative study of two modes of prenatal care. A national panel of experts, assigned by the Department of Health and Human Services to study prenatal care, proposed that the traditional model of care evolved from the vigilant monitoring for signs of toxemia, which also explains the timing of visits and the emphasis on the trimester (Public Health Service Expert Panel [PHSEP], 1989). The panel's task was to determine if the content of prenatal care offered or could offer optimum health care to the pregnant woman, as well as benefit the family and the infant's first year of life. There was also a need to better understand the "mechanism through which specific components of prenatal care contributed to improved pregnancy outcomes" (PHSEP, p. 6).

As a result of the panel's findings, a recommended model of prenatal care was developed. The model emphasizes preconception and early pregnancy care, a modification of visit times and assessment activities, and the importance of education relative to pregnancy, childbirth, and parenting. Additionally, it promotes the woman's involvement in her prenatal care.

The recommended model is in accord with today's new system of health care in the United States. It portrays a mode that could meet the managed care themes of cost containment, prevention, education, and health promotion without jeopardizing the provider's rationed time to deliver services. Favorable outcomes for both mother and infants and long-range family benefits will provide final judgment of the model.

Costing System

Conventional costing systems are usually volume-based accounting systems. "That is, indirect costs are applied to products by using some . . . bases such as direct labor hours. Consequently, low-volume products are considerably overcosted" (Finkler, 1994, p. 632). Translating this into prenatal care, it would consist of the same costing for all prenatal care efforts rather than differentiating characteristics and activities of a visit.

Activity-based costing (ABC) involves a different approach. "In an activity-based costing system, the allocation bases used for applying costs to products are called cost drivers and they include any causal factor that increases the total costs of the activity" (Finkler, p. 633). One discussion of the ABC model described it as being able to "physically mirror the activities of people, machines, and equipment." (Cokins, Stratton & Helbling, 1993, p. 1). It provides an explanation of the rate at which resources are consumed by activities and why they are used.

Chan (1993), a business professor in Canada, explains ABC use in a hospital cost accounting study in the following way. The accumulation of cost for activities that consume resources was applied to products (patients) based on the activities required for the production (clinical services). The author believes that whether a million units of a product are being manufactured or patients being treated, the principles of cost application using ABC are the same (p. 633). It is interesting to note that accountants first described the ABC method in the 19th century. The complexity of the business environment and the explosion of computer technology have generated new interest in its usefulness (Cokins, et al., 1993; Cokins, 1996; Finkler, 1994; Wolosky, 1998). A further review of the literature revealed the model's wide use in the business world, especially production and manufacturing, but found that it is also being applied in hospital and home health accounting studies.

ABC's use and applicability to prenatal care have been documented by reports from the Franciscan Health System Midwifery Services in Tacoma, Washington, and highlighted in a manual, *Managed Care*, published by the American College of Nurse-Midwives (ACNM) in 1996. In the Franciscan practice, the application of this costing method was used to cost 5,500 visits over a 1-year period. Direct and indirect costing were broken

down to hourly rates and included both active (hands-on) and passive (chart preparation, filing, etc.) activities. It is notable that the Franciscan practice was also analyzed using the conventional cost accounting method, but the activity analysis of cases was reported to provide more comprehensive data and "is expected to be the most prevalent cost accounting method for managed care" (ACNM, p. 43).

Purpose and Research Questions

The purpose of the present pilot study was to examine the contact time and activities for new and return prenatal visits in a private nurse-midwifery practice and to translate this time into cost using the ABC method of accounting. The findings can then be used to hypothesize alternative delivery systems with potential to deliver efficient but high quality prenatal care. The following questions were addressed:

1. What is the cost of prenatal care for new and for return visits?
2. Are there cost differences between contact time with a new and a return visit?
3. What are the major direct and indirect cost activities?
4. What are the cost drivers in the delivery of prenatal care?

A definition of terms is as follows:

- new prenatal visit—the initial prenatal visit to a health care provider
- return prenatal visit—all follow-up prenatal visits to a health care provider
- activity-based costing—a costing method that identifies activities that consume resources and translates those activities into cost
- activities—direct and indirect costs incurred to provide prenatal services
- direct cost—cost directly associated with a service activity
- indirect cost—cost indirectly associated with a service activity, such as overhead expenses or rent, utilities, and equipment

- cost driver—activities consuming cost
- resources—people, equipment, supplies, etc. that allow activities necessary for the delivery of services

Methodology

Characteristics of the Site and Sample. The site used for the data collection for this study was a private nurse-midwifery practice in which an average of 325 prenatal clients is seen each month. A receptionist, a nurse, and an office manager assist one full-time nurse-midwife and one part-time nurse-midwife in the delivery of services. The office is open Monday through Friday, with daytime and selective evening hours. The nurse-midwives offer full scope maternity care, as well as gynecology and well-women services. For the purposes of this study, only prenatal services were analyzed.

Data Collection and Subjects. Data collection consisted of non-participant observation of time-related activities of the services in the office. These were a nurse-midwife, nurse, receptionist, and office manager. Over a 4-week period, a researcher visited the office and, using a data collection strategy developed for the study and described below, monitored time/activity contact with each member involved in the delivery of services. The data were collected on the following service-provider activities:

- receptionist—greeting of client, preparing client's record, scheduling follow-up appointment
- nurse—greeting of client, education for urine collection, chart review, blood drawing, urine specimen analysis, obtaining client's weight, preparing client in examining room
- certified nurse-midwife—chart review, collection of current historical and physical data, management based on data collection and including education relevant to the pregnancy and good health
- office manager—payment/billing arrangements and processing

Data were collected from provider/staff contacts with a sample of 35 low-risk clients in a nonsystematic, convenient manner of selection. This method was used because of constraints regarding availability of clients and avail-

ability of the health provider who frequently had to cancel in order to attend a laboring client. The research monitored the contact time of the client with each member of the office staff and with the health care provider. The time engaged with a client was measured by a stopwatch and was noted and recorded in minutes and seconds. Indirect cost activities data were calculated after interviews with the owners of the practice and the office manager.

The study was approved by the Human Subjects Internal Review Board of the sponsoring academic institution and by the owner of the nurse-midwifery practice. Informed consent was obtained from participants involved in the time-measured activity study. The consent form included a statement that the data collected had no evaluation component and offered no risks or benefits to the employees in the practice setting.

The time/activity data collected were collated for the receptionist, the nurse, the two nurse-midwives, and the office manager. A computerized database using a coding system for each of the subjects and their related activities was established. Statistical means were calculated in seconds and converted to minutes for all cases in the "return visit" category ($n = 30$) and all cases in the "new visit" category ($n = 5$). This process was repeated after removing the subject outliers that were above or below 2 standard deviations from the mean, and these are the reported numbers.

Salary data were organized into weekly rates of cost of salaries and benefits for each employee. These figures were then used to determine the cost of individualized activities by computing in rates of costs per minute. The activity and cost data were computed for both full-time and part-time nurse-midwives and found to be nearly identical when broken down to this level.

Indirect costs were broken down from an "annual" cost to cost per minute based on a 12-month, 52-week year and a 40-hour workweek. These sunk, fixed, and overhead costs ranged from rent to office and medical supplies.

Findings

The total activity time and cost are displayed in Table 1. As calculated, the average total time for a new visit was 75 minutes. The average total time for a return visit was 30.6 minutes. Wages, benefits, and indirect costs

Cost Analysis of Prenatal Care Using the Activity-Based Costing Model: A Pilot Study

Table 1 Relative Activity Time & Cost Summary

	Time (Min.)	Labor Cost*	Indirect Cost**	Total Cost
New Visit	75.0	\$27.45	\$57.67	\$85.13
Return Visit	30.6	\$10.27	\$20.21	\$30.48

*Labor Cost = Wages + Benefits of Office Staff

**Indirect Cost = Overhead Costs + Nurse-Midwife Activity Time

resulted in a total cost of \$85.13 for a new visit and \$30.48 for a return visit. The nurse-midwife activity time was included in the indirect cost calculations. This was done because the researchers concluded that it was the health care provider who was most directly linked to generating indirect costs through the various resources needed in order to offer prenatal care services. The other staff could be considered auxiliary personnel who enable the nurse-midwives to focus a higher percent of their time on patient care. There are other ways to formulate the total cost, but since the objective of ABC is limited to examining what activities are consuming resources, this approach seemed logical.

Figure 1 presents the time expended for activities by each individual involved in the services to new prenatal clients and the cost for these.

As one might expect, the nurse-midwife represents the most activity time and cost at 52.8 minutes and a cost of \$24.13. The nurse, receptionist, and office manager activities are much less, ranging from 15.5 minutes at a cost of \$2.32 for the nurse to 1.6 minutes and \$0.24 for the office manager. It is recognized that, if data on the "passive activities" such as filing, providing paper work for the client to complete, setting up the initial appoint-

An additional finding is that, in general, the nurse-midwife spent approximately equal time with assessment and education activities.

ments by phone, and reviewing insurance benefits and coverage are calculated, these figures for the nurse, receptionist, and office manager would increase considerably. But it was not the intent of the researcher to include the "non-contact" activities in this pilot analysis since the purpose is to investigate whether the contact activities are generated in the most efficient manner and not to calculate the total cost of doing business.

The activity time and cost for a return visit were predictably less than those for a new visit. As illustrated in Figure 2, there is a difference of nearly 35 minutes and \$16 between the new and return activity/cost for the nurse-midwife. An additional finding is that, in general, the nurse-midwife spent approximately equal time with assessment and education activities.

Figure 1 Relative Activity Time & Cost Per Subject Per New Visit

Figure 2 Relative Activity Time & Cost Per Subject Per Return Visit

It was noted that many return visit clients spent no contact time with the office manager who is responsible for insurance and payment arrangements. Once payment arrangements were made, there was little need for further contact. It should be emphasized that the focus here was relative costs of clients' contact access to personnel. Total cost of prenatal care was not studied here, and the dollar amounts here do not apply to other practices.

Discussion

The findings of this pilot study suggest that the activities of the nurse-midwife (the health care provider) constitute the major cost driver of this practice. While the prenatal client may be viewed as a major cost driver, it is the health care provider who is in the position to modify or reorganize the utilization of resources without jeopardizing the care of the client.

While the prenatal client may be viewed as a major cost driver, it is the health care provider who is in the position to modify or reorganize the utilization of resources without jeopardizing the care of the client.

This is an important concept; because, as discussed earlier, cost containment is an issue directed at the health care provider who is being asked to increase volume of clients (increase production) and to do so at a lower cost. The prevailing argument is that this cannot be done without sacrificing quality and personalized care and, sometimes, even safety. Yet, McKeon (1996), who examined the use of ABC in studying financial management in home health care, concluded that the concept of activity management best interfaces with the quality management plan. He believes that implementing management based on the ABC method of accounting will promote an integration of quality management and cost accounting because of the detailed nature of the data.

ABC is an approach that has not been addressed in the literature of prenatal care. Reportedly, most studies were linked to benefit or cost effectiveness of a treatment or intervention rather than an explanation of a change in

delivery services or related policies (Smith & Blackmore, 1998). The time expended by the nurse-midwife with the prenatal client in this study is comparable to that reported in a national study of time-associated clinical services by nurse-midwives. Clinics, private offices, and birth center settings were included. As in the present study, the researchers also found assessment and education by the nurse-midwife consumed nearly equal amounts of time (Scupholme, Paine, Lang, Kumar & DeJoseph, 1994).

This consistency of results strengthens the hypothesis that modifications in the traditional model of prenatal care as proposed by the Expert Panel on Prenatal Care in 1989 may offer a solution to the time/service issue that haunts providers of health care and nurse-midwives in particular. Elements such as equal spacing of visits, reduction of routine data collection on every visit (even the concept of "routine" visits), and an emphasis on comprehensive education all based on a satisfactory risk assessment could be reorganized. Activities and the time allotted for them would be redistributed. Consequently, it could resolve the conflict of time/service needs/quality that exists in today's managed care arena, as well as allow for increased volume of visits per nurse-midwife.

If the emphasis on comprehensive education proposed in the Expert Panel's recommended model of prenatal care were a formal responsibility of a less expensive nurse/health educator, it would allow time for the nurse-midwife to see additional clients and still be assured that the instructional elements were being covered.

For example, the nurse-midwives each reported that about 50% of their time with their clients was spent on education. If the emphasis on comprehensive education proposed in the Expert Panel's recommended model of prenatal care were a formal responsibility of a less expensive nurse/health educator, it would allow time for the nurse-midwife to see additional clients and still be assured that the instructional elements were being covered. Content could be reinforced by the nurse-midwife to provide continuity of care, but that activity would

require less time than basic instruction and would not preclude the instruction nurse-midwives like to incorporate as they conduct a visit. There are multiple ways to link with other members of the health care team in order to promote clients' self-help and to assure that all the client education components prescribed by the health care provider are being met. New strategies for individual and group sessions, as well as a variety of innovative ways to disseminate information, are being explored to achieve the goals and objectives of health education in today's managed care system (Krantz, et al., 1998; Schaffner & Bohemey, 1997; Taheri-Kennedy, 1997).

New strategies for individual and group sessions, as well as a variety of innovative ways to disseminate information, are being explored to achieve the goals and objectives of health education in today's managed care system.

The ABC accounting method lends itself to the examination of the direct cost of client contact. Based on the findings of this pilot, the instrument and methodology for data collection can be further refined and expanded to capture more specificity of direct contact activities. Limitations of the study were the small number of prenatal cases monitored and an inconsistency in the opportunities to collect data. Nonetheless, the time and cost differences are so great that the results of a larger study can be expected to be similar. Time monitoring in this pilot was limited to direct clinical contact. In future studies, data also need to be collected on the "passive" indirect activities that consume office staff time such as filing, tracking laboratory information, scheduling procedures, and phone calls. The inclusion of such data would no doubt change the quantitative findings of this study. However, the principle is the same in that some additional nurse-midwife activities can be transferred to less expensive personnel without the loss of quality of care. Nonetheless, this hypothesis needs testing to verify its validity. Many approaches can be taken, but costing at an activity level can provide useful data in the quest to meet new economic demands in today's health care system.

Acknowledgments

Acknowledgments for their assistance with this study are extended to David Weir, MBA, Senior Consultant with World Class Finance, KPMG Peat Marwick, LLP; Clarissa Carbo, CNM, MSN; and Jose Carbo, BA, Health Science Administrator.

References

- Academy of Health Care Management. (1997). The evolution of health care delivery and financing in the United States. *Managed health care: An introduction*. Washington, DC: Academy for Health Care Management.
- American College of Nurse-Midwives. (1996). *Managed care*. Washington, DC: American College of Nurse-Midwives, 39-70.
- Bodenheimer, T. & Grumbach, R. (1995). *Understanding health policy*. Norwalk, CT: Appleton-Lange.
- Chan, Y. (1993). Improving hospital cost accounting with activity based costing. *Health Care Management Review*, 18(7), 71-72.
- Cokins, G. (1996). *Activity-based cost management*. Chicago, IL: Irwin Professional Publishing.
- Cokins, G. Stratton, A. & Helbling, R. (1993). *An ABC manager's primer*. Burr Ridge, IL: Irwin Professional Publishing.
- Finkler, S. (1994). *Cost accounting for health care organizations*. Gaithersburg, MD: Aspen Publications.
- Germano, E. & Bernstein, J. (1997). Home birth and short-stay delivery: Lessons in health care financing for providers of health care for women. *Journal of Nurse-Midwifery*, 42(6), 489-498.
- Kovner, A. (1990). *Health care delivery in the United States*. New York: Springer Publishing Company.
- Krantz, B. Wandel, J. Fladger, A., Folcarelli, P. Burger, S. & Clifford, J. (1998). Developing patient and family education services. *Journal of Nursing Administration*, 28(2), 11-18.
- McGlynn, E. (1998). The effect of managed care on primary care services for women. *Women's Health Issues*, 8(11), 1-14.
- McKeon, T. (1996). Activity-based management: A tool to complement and quantify continuous quality improvement efforts. *Journal of Nursing Care Quality*, 10(2), 17-24.
- Public Health Service Expert Panel on the Content of Prenatal Care. (1989). *Caring for our future: The content of prenatal care*. Washington, DC: Public Health Service Department of Health and Human Services.
- Schaffner, R. & Bohemey, J. (1998). Demonstrating APN value in a capitated market. *Nursing Economics*, 16(2), 69-74.
- Scupholme, A., Paine, L. Lang, J., Kumar, S. & DeJoseph, J. (1994). Time associated with components of clinical service

-
- rendered by nurse-midwives. *Journal of Nurse-Midwifery*, 39(1), 5–12.
- Smith, W. & Blackmore, C. (1998). Economic analysis in obstetrics and gynecology: A methodologic evaluation of the literature. *Obstetrics and Gynecology*, 91(3), 472–478.
- Starr, P. (1982). *The social transformation of American medicine*. New York: Basic Books, Inc.
- Stone, D. (1997). The doctor as businessman: The changing politics of a cultural icon. *Journal of Health Politics, Policy and Law*, 22(2), 533–554.
- Taheri-Kennedy, B. (1997). Meeting women's self-care interests and needs: The potential of the Healthwise intervention by childbirth educators. *Journal of Perinatal Education*, 6(3), 27–31.
- Wolosky, H. (1998, February), A renewed interest in activity based costing. *The Practical Accountant*, 29–33.

Achievement-Based Comfort

I am sustained by a sense of the worthwhileness of what I am doing; a trust in the good faith of the process which created and sustains me. That process I call God.

—Upton Sinclair

We're constantly striving for success, fame and comfort when all we really need to be happy is someone or something to be enthusiastic about.

—H. Jackson Brown