The Promise of Regional Perinatal Care as a National Strategy for Improved Maternal and Infant Care

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THE STRATEGY OF REGIONAL PLANNING has been the subject of much attention in recent years. In the history of the delivery system for perinatal care, the attempt to broadcast the benefits of modern perinatal medicine to entire regions, to every pregnant woman, and to every hospital and provider within each region is a startling development. From 1975 through 1980, when I was engaged in efforts to regionalize perinatal care in the United States and Canada, I was impressed not only with the dedication of the obstetricians and pediatricians who chose to implement regional programs but also with the evidence of their success. Although I am neither an obstetrician nor a neonatologist—but interested in improved systems of care, especially for vulnerable groups—I have found much that is good in regional perinatal care. I therefore offer regional perinatal care as a highly useful strategy for improving maternal and infant care.

In the early 1970s, much optimism was generated among the U.S. leaders in perinatal medicine about the potential benefits of regional planning. It was postulated that a regional plan would ensure access to the appropriate level of care for all women and their newborn within an entire system. The optimism was apparent in a 1975 report, "Toward Improving the Outcome of Pregnancy" (*1*). The issuance of this report, which emphasized measures that would promote communications among regional providers and integration of services relating to perinatal care, was a critical incident for the delivery system for perinatal care. That a group of health professionals was calling voluntarily for regionalization of care could be considered both radical and naive in the United States. Regionalization of health services has been the hope of many in this country for the past 50 years.

The difference between previous calls for regional planning and that called for in "Toward Improving the Outcome of Pregnancy" was the specificity for the regional perinatal plan and a high level of confidence in the potential benefits of regional perinatal care. Such confidence was not apparent from the mid-1920s to the mid-1940s. There were few perinatal interventions, except for the hospital-based premature nursery. The paradox relating to this period was that the long-term outcome of surviving low birth-weight infants, as documented by Hess (*2*), was remarkably good. For high-risk infants, it was a period of survival of the fittest.

The scientific base of neonatology was advanced in the mid-1940s, but with many hard lessons to be learned about matters such as the use of oxygen, vitamin K, and the choice of antibiotics. The outcome of surviving infants, measured in terms of growth and development at later birthdays, was discouraging and did not approach Hess' results. Neonatal mortality rates declined, but it was the period of survival of the not so fit. The outcome raised serious ethical questions about the appropriate use of technology.

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However, confidence has been restored by a splendid series of advances in both neonatology and maternal and fetal medicine. The technology has proved both safe and effective, as measured by the long-term outcome of surviving infants in the low and very low birth-weight categories. The data in figure 1 are cited from published reports (*3–14*) of followup studies, from selected centers, of high-risk infants at varying birth weights for the period 1955 to 1976. Although the results were not applicable to entire regions, they were the basis for confidence—80–90 percent of the infants weighing less than 1,500 grams at birth were spared severe disability.

It is of interest that concurrent with advances in perinatal medicine the public health scoreboard changed from the gross measure of infant mortality to a measure of performance that accounted for fetal losses and stillbirths—perinatal mortality. A contemporary measure in the face of declining mortality rates is the quality of life of the surviving infant. In the past 20 years we have moved along a continuum of increasing expectations, from life or death to the quality of the survivor and to the social environment that will provide every child with a fair chance for optimal growth and development.

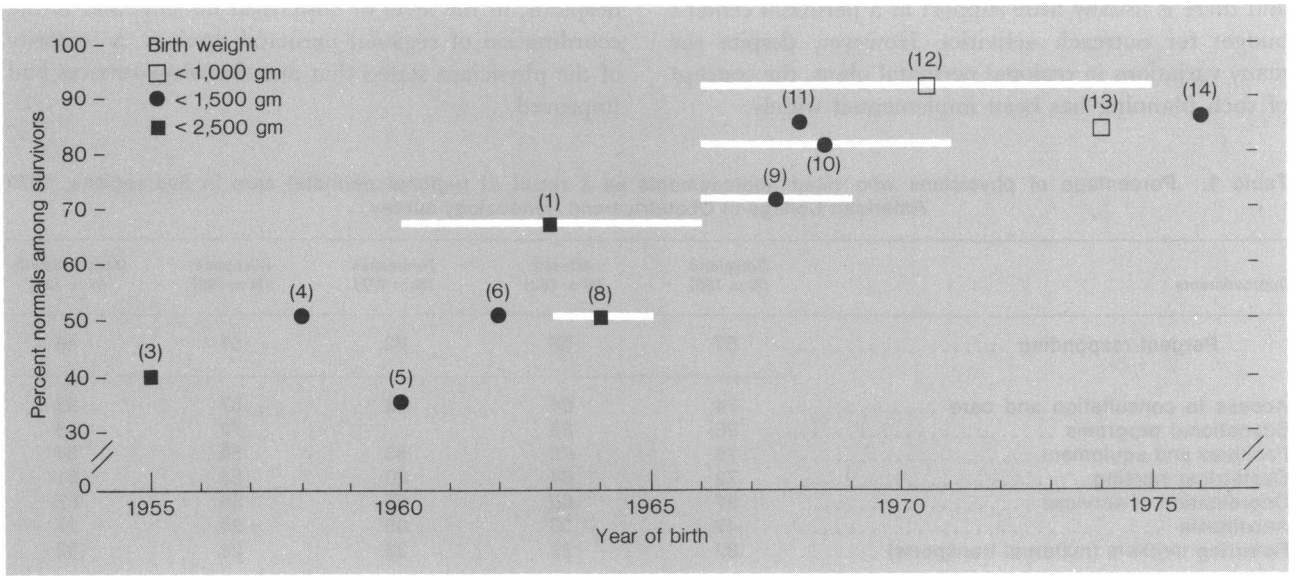
Regional Perinatal Care

There is a danger in citing regional perinatal care as the model strategy of the delivery system for perinatal care. How well the system functions is determined by a complex interaction of natural and social supports, the physical environment, and the medical support system. Within the highly complex delivery system for perinatal care, it is difficult and unwise to choose one determinant as the most important. The effects of poverty, unplanned pregnancies, poor nutrition, and other social factors contribute enormously to the poor outcome of pregnancy. Always implicitly—and sometimes explicitly—in the providers' view, the concept of risk is what drives the system. To identify those mothers and infants who are at high risk of a poor outcome is the common strategy. The strategy is preventive—the earlier the application, preferably before conception, the better.

Nonetheless, even with the virtual elimination of social and economic gaps, we would still have high-risk mothers and infants in need of effective medical intervention. To develop an effective delivery system, we cannot afford significant omissions. Uneven access to effective perinatal medical care has been and remains a problem. Thus, I believe that all segments of providers of maternal and infant care would welcome the new strategy of regional perinatal care.

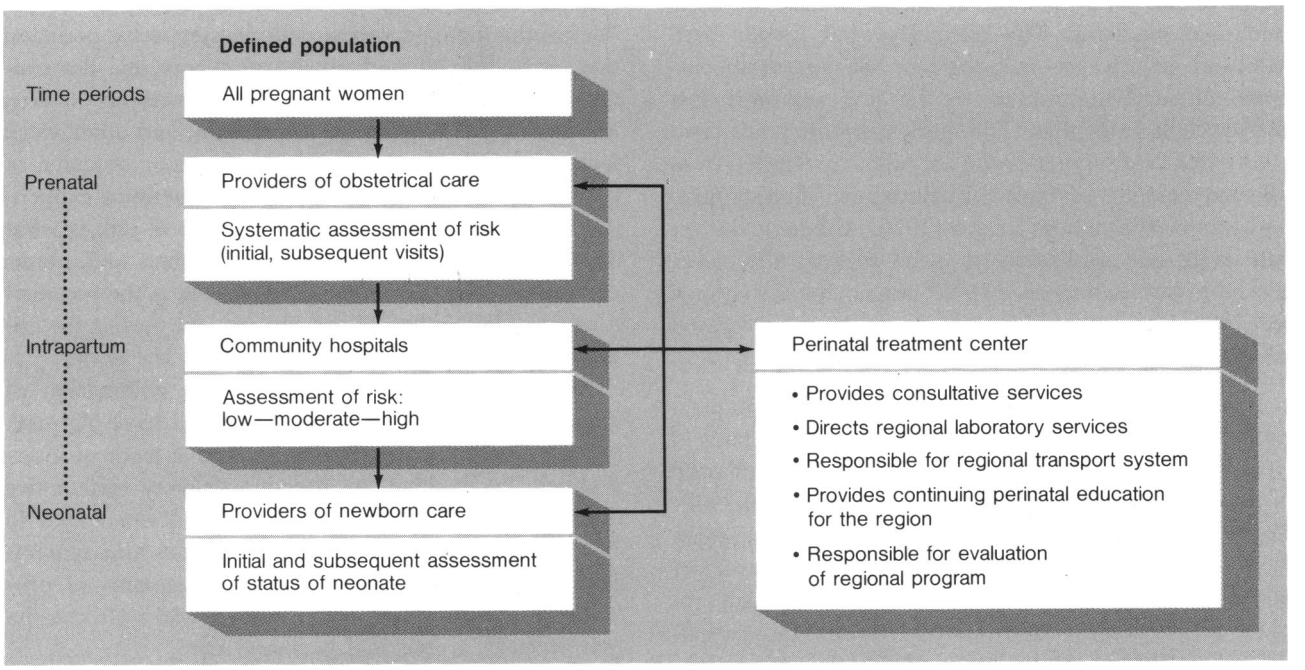
What most perinatologists would agree constitutes a regional plan of perinatal care is shown in figure 2. The regional plan is a network, within a defined region, of all providers of care at all levels of care. The target population includes all pregnant women. The functional elements include risk assessment, the use of a uniform information system, and the services provided by the regional perinatal center to the region—for example, consultation services, laboratory services, con-

Figure 1: Published reports[1] of developmental followup of infants with varying birth weights at 2-10 years of age



[1]Numbers in parentheses are references.

Figure 2: A regional plan of perinatal care



tinuing education and training, and treatment services. The only reliable identifier of a participating hospital in this model is its inclusion in the regional information system.

Within the past 6 years, regional perinatal plans have become ubiquitous. Every State has some kind of regional plan. The majority of the States, however, do not have regional information systems, and many have little obstetrical outreach from the perinatal center to the region. Regional information systems are expensive, and there is usually little support in a perinatal center's budget for outreach activities. However, despite the many variations in regional perinatal plans, the concept of such planning has been implemented widely.

What are the benefits of regional perinatal care? As shown in tables 1 and 2, the results of the 1979 American College of Obstetrics and Gynecology's surveys of obstetricians practicing in five regions where perinatal care had been regionalized help to identify what physicians perceive as benefits (*15*). The physicians reported improved access to consultation and care for their high-risk patients and for themselves, improved educational programs. They also reported substantial improvements in facilities and equipment in community hospitals, in the level of obstetrical nursing, and in the coordination of regional perinatal services. A minority of the physicians stated that anesthesiology services had improved.

Table 1. Percentage of physicians who cited improvements as a result of regional perinatal care in five regions, 1979 American College of Obstetrics and Gynecology survey

Improvements	*Cleveland (N = 120)*	*Arizona (N = 182)*	*Tennessee (N = 177)*	*Wisconsin (N = 193)*	*Massachusetts (N = 235)*
Percent responding	57	58	62	57	46
Access to consultation and care	74	64	66	57	53
Educational programs	90	88	...	72	68
Facilities and equipment	75	75	63	50	54
Obstetrical nursing	72	64	60	53	51
Coordination of services	81	80	69	56	62
Anesthesia	49	36	39	24	37
Referring mothers (maternal transports)	32	27	33	20	32

SOURCE: Reference 15.

Table 2. Percentage of physicians who cited improvements as a result of regional perinatal care in Cleveland and Arizona, by level of hospital, 1979 American College of Obstetrics and Gynecology survey

Improvements and hospital level	*Cleveland (N = 120)*	*Arizona (N = 182)*
Access to consultation and care:		
I	62	91
II	79	63
III	63	51
Educational programs:		
I	100	81
II	87	84
III	95	95
Referring mothers (maternal transport):		
I	42	42
II	33	44
III	20	3

NOTE: Hospital levels are defined in reference 1. Source of data reference 15.

Benefits of Regional Plans

What can be said about the feasibility of regional perinatal plans? Whether any set of personal health services in the United States could be regionalized was a worrisome question in 1975 for the Robert Wood Johnson Foundation when it invested $20 million in demonstrations of regional perinatal care in 8 U.S. regions. Five years later, feasibility was not an issue. For example, in the Cleveland region 64 percent of all hospitals were participating fully in the regional network, and 76 percent of all pregnancies and births were in the system. In Arizona, 57 percent of all annual pregnancies and births were included in the regional information system; the corresponding proportion in the Syracuse region was 70 percent. The system that accounts for 70 percent of perinatal events in a given year is one that provides morbidity and mortality conferences throughout the region, that upgrades the skills of nurses and physicians, and that provides easy access to consultation—including access to specialized laboratory and outpatient services.

How well the regional plan is working to anticipate poor outcome is reflected in changes in the number and proportion of high-risk mothers who are referred to perinatal centers before delivery; such patients usually are described as maternal transports or transfers. In the first 2 years of regionalization, sharp increases occurred in the number of maternal transfers. In Arizona, 300 maternal transfers took place in Tucson and Phoenix in 1975, the first year of the program; in 1979, the number exceeded 600—an underestimate because this number did not include direct admissions. For example, in 1 Phoenix perinatal center from July 1979 to June 1980 there were 196 maternal transports and 340 direct admissions of high-risk maternity patients.

The benefits for a high-risk maternity patient who delivers in a perinatal center have been documented by Harris and associates (*16*) in a comparison of the outcome of neonates born to maternal transports with the outcome of neonates transferred after birth. For infants weighing less than 1,500 gm and born before 34 weeks' gestation, the difference in survival was significant. Followup by Sell (*17*) of the survivors from each group indicates a persistent and significant advantage in terms of decreased morbidity for the neonates born to mothers who were transported before delivery.

The great surge in the number of maternal transports says little about preventive strategy if unaccompanied by a decline in neonatal transports. In Arizona, while the rate of maternal transports rose over a 5-year period, 1976–80, from 2.6 to 5.2 per 1,000 live births—an increase of 100 percent—the rate of neonatal transports declined from 16.0 to 13.9, a 13 percent decline. A confounding factor in the interpretation of the decline in neonatal transports is that with a regional plan the very low birth-weight infant is more likely to be considered viable and a candidate for transfer. To the extent that such transfers occur, the tradeoff of maternal for neonatal transports is obscure.

Regional perinatal care can be considered to be feasible and to have generated added benefits to the high-risk mother and infant, as well as to physicians and other health care professionals. But, has the decrease in neonatal mortality been associated with an increase in infant morbidity? Shapiro and associates (*14,18*) address this question in their reports on two rounds of morbidity surveys of 1-year-olds who were born in the eight regions participating in the Robert Wood Johnson Foundation's program that began in 1975. Their first report is of a survey that included approximately 5,000 infants aged 1 year who were born in 1976 and were not subjects for regional perinatal care. The second report provides the results of a survey of approximately 2,900 age-1 infants who were born in 1978 and were subjects for regional perinatal care. The investigators' major conclusion was that the results did not provide support for the hypothesis that a decrease in neonatal mortality is associated with an increase in infant morbidity.

Cost of Regionalization

What is the cost of regionalizing perinatal care? I. R. Merkatz (Cleveland Perinatal Program, unpublished data, 1978) estimated the cost of maintaining a re-

gional information system and of a staff to provide consultative services to the region to be about $20 per mother-infant pair or $200,000 per 10,000 deliveries a year. This in an incremental cost, offset to some extent by the current cost to hospitals of maintaining obstetrical and neonatal records. Obviously, this cost is just a fraction of the cost of providing direct perinatal services in a region.

It is unfortunate that support for regional perinatal programs is being sought in the current environment of economic stringency. I cannot cite any studies relating to the evaluation of the efficiency of regional perinatal care. In the process leading to a statement relating to efficiency, the program in several regions can be defined clearly; however, it would be difficult to get a handle on a comparison region in a "no program" State. I believe that we have sufficient data to define the effectiveness of the program, for example, that the program does more good than harm or that it projects beneficial effects in the future in terms of quality adjusted-life years, but it is unlikely that corresponding information will be available (mainly because of cost) in a "no program" comparison region. I believe that the case for regional perinatal care rests presently on its presentation as a prudent investment in the organization of a system to improve standards of perinatal care and to assure access of the pregnant woman and newborn to the level of care they require. If we consider the alternative, at best an informal centralized network, regional perinatal care is a prudent investment.

Discussion

For the first time in the otherwise dismal history of efforts to regionalize personal health services, vigorous support for regional perinatal care has emerged from the medical professional sector. Further, several demonstrations of regional perinatal care have provided data attesting to its feasibility, acceptance, effectiveness, and safety.

The enthusiasm for regional perinatal care represents an enormous change in the national perspective on the care of mothers and infants. The expressions of its supporters, relating to what regional perinatal care can accomplish in the United States, are in sharp contrast to the frequent recitation, especially in the 1960s, about our demographic dissimilarity to Sweden or about the ignorance and apathy of the poor who contribute heavily to the nation's infant mortality rates. In the 1970s, perinatologists shifted the burden to the perinatal delivery system to provide access to the needed level of care.

Another good feature about regional perinatal care —and one that is largely unappreciated—is its melding of the private sector with the public sector in a common mission. The leadership in regionalizing perinatal care has come almost exclusively from the university medical center. The director of a regional perinatal program soon becomes greatly interested in how the multiple public programs—maternal and child health, sudden infant death, family planning, nutrition and dietary services, and developmental disabilities—contribute to regional perinatal care, as well as how administrative regulations may be true obstacles in establishing a network of care. I believe that the level of interest generated by regional perinatal care in coordinating and integrating the resources and actions of both the public and private sectors is unprecedented in our society.

When we consider the deep pockets of rural and urban failures of the nation's perinatal delivery system, we should welcome their inclusion in an orderly network of perinatal care. Bringing the ghetto hospital and the isolated rural hospital into the mainstream is clearly different from neglect. Unfortunately, some regional perinatal care is not perceived as a highly useful network that provides more switching points and interfaces than we have enjoyed before. It is also unfortunate that regional perinatal care is often misperceived as centralized care—equated with access to the sophisticated technology of the tertiary care center.

Regional perinatal care is not a panacea, but it is a strategy that holds much promise. Despite its apparent ubiquity, such care still has far to grow before it will have a substantial impact on improving the outcome of pregnancy, and unless it is joined closely to the social support system its benefits will be limited.

The replication of regional perinatal networks throughout a State or the nation is not likely to proceed as well as the eight demonstrations of the Robert Wood Johnson Foundation's program or the many other demonstrations now in place. Primarily, the demonstrations were purely voluntary and their leadership was inspired. Every State that wishes to have a system of perinatal care will have to invest in building a broad constituency among providers after it has settled its own internal administrative issues. Hospital administrators and physicians nationwide have become sensitized to regulation; thus, they are likely to interpret regional planning of perinatal care, when sponsored by government, as a threat. This is especially true of hospitals with low-volume obstetrical services,

for example, fewer than 1,000 deliveries per year, whose continuing existence has been threatened by regulatory agencies in States such as Massachusetts and New York.

Regional networks of perinatal care can provide a substructure to which multiple programs that provide an array of services to mothers and infants can be affixed. The usefulness of the regional information system in identifying newborns who are at high risk of serious handicaps is impressive. The regional information systems in the 8 regions of the foundation's program now account for 60–70 percent of all births annually in those regions. Further, regional perinatal networks representing an unusual melding of efforts in the public and private sectors form a unique structure for coordinating diverse efforts and interests in maternal and infant health.

Perhaps the best feature of regional perinatal care is its unitary focus on the individual patient, assessing her needs and providing interventions to reduce the risk of pregnancy to mother and infant. The success of regional perinatal care depends totally on the strength of the partnership that has created the network. In the establishment of regional systems, providers have shown a remarkable resolve to work together and to begin to address the problems that extend beyond their own institutions.

Directors of regional perinatal programs have contributed significantly to the reorganization and increased effectiveness of services to mothers, infants, children, and adolescents. The work of Davidson (*19*) and Merkatz (*20*) are but two examples.

Regional perinatal care offers the best opportunity to begin to structure an organization of maternal and infant care that will initiate the complex interplay of social, medical, and environmental factors that determine the outcomes of pregnancy and early life and that will start to close the gap between the "haves" and the "have nots."

I have presented regional perinatal care as a strategy that holds enormous promise for the optimal provision of services to mothers and infants. As a strategy, it surely is a level 3—looking for results of diminished mortality and morbidity in an entire region that transcend the narrow objective of individual providers and institutions. We have few such tertiary-level strategies that have any chance of success.

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