

REVIEW ARTICLE

## Regionalized perinatal care in North America

Herman A. Hein

University of Iowa Carver College of Medicine, Room 213–214 General Hospital, 200 Hawkins Drive,  
Iowa City, IA 52242, USA

### KEYWORDS

Regionalization;  
Perinatal health care;  
Neonatal care;  
Organization;  
Iowa model of  
regionalization;  
Non-tertiary referral  
centres;  
Impact of managed care  
on regionalization;  
Monitoring impact of  
managed care on  
regionalization;  
Future of  
regionalization

**Summary** The aim of this article is to familiarize the reader with the status of regionalized perinatal health care in North America, and specifically in the United States of America, using the Iowa regionalization model. The evolution of the regionalization movement in the late 1960s and early 1970s is reviewed. It is noted that the movement was largely without federal government intervention. The role of the March of Dimes in developing the first set of so-called national guidelines is chronicled.

The Iowa model, utilizing some non-tertiary referral centres, is discussed in depth. This model included extensive outreach education for the entire state, and worked well largely because of the lack of competition to the major university teaching hospital located at the University of Iowa in Iowa City. This was not true for many other states and regions because competition did exist between tertiary centres.

The impact of managed care systems on the overall role of regionalization is discussed. Suggestions are offered for controlling the impact of third-party payers (managed care) on the quality of perinatal health care. An idealized system of monitoring the impact of regionalization and monitoring the effect of managed care is detailed. Finally, the future of regionalization is discussed in the face of deregionalization in populous areas. The need for the best possible care as close to patients' homes as possible (regionalization) still seems apparent.

© 2003 Elsevier Ltd. All rights reserved.

### Introduction

The purpose of this article is to acquaint the reader with the status of regionalized perinatal care in North America, specifically in the United States of America (USA). Although North American states and regions outside the USA have elements of regionalization, they are largely dictated by systems of nationalized health care. The effects of nationalized health care are extensive and beyond the scope of this article. Accordingly, the focus will be on states and regions within the USA.

### The early history—the evolution of regionalization

During the late 1960s and early 1970s, it became apparent that improved neonatal salvage was possible because of new care techniques in both obstetrics and paediatric practice. A myriad of changes involving better metabolic and nutritional care for neonates, refined neonatal ventilator capabilities, and more aggressive treatment of infections became available for compromised neonates, especially low-birthweight babies. When these improved neonatal care techniques became apparent, obstetricians soon recognized that certain pregnant women could benefit from

*E-mail address:* herman-hein@uiowa.edu (H.A. Hein).

delivering in a hospital where the newer care practices would benefit the patient's potentially compromised newborn.

Thus, the stage was set for the beginning of a new era in perinatal health care—the regionalization of care. The concept of regionalization is not the brainchild of perinatal medicine. This concept has been practiced for years, especially in the surgical subspecialties where patients requiring a specific treatment or type of surgery have been referred to specialty centres for as many years as can be remembered.<sup>1,2</sup>

As with the surgical subspecialties, when specialized care was recognized as an important factor in outcome, perinatal care adopted the principle of regionalization of care. Interestingly, there was no attempt by the federal government operating through the Department of Health and Human Services to develop and/or enforce any system of regionalized perinatal health care. Thus, it was not a matter required by law, but rather it was necessary to improve outcome. In many instances, the newer approaches to improved perinatal health care were only available in major metropolitan areas or teaching hospitals. Rural and underserved areas were unable to receive the benefit of the newer and better care techniques. Accordingly, physicians practicing in these areas were made aware of benefits that their patients could appreciate in the centres, and encouraged to send such patients as soon as possible, especially in utero. Transport systems were quickly stylized to assist in assuring rapid transfer of patients, and by the early 1970s, many if not most of the states in the USA experienced some attempt at the development of a regionalized system of care.

The first attempt at bringing uniformity to a splintered national process came from the March of Dimes. This organization co-ordinated a task force to study the nature of the various states' efforts at regional system development, and to make recommendations for the development of an idealized regionalized system in each state. The final work product of this effort was produced in 1976 and published in 1977 as 'Toward improving the outcome of pregnancy'.<sup>3</sup> This report defined central features of a systematized cohesive regional network in which the complexity of patient needs determined where and by whom the care should be provided. A major intent of this work was to achieve timely transfer of high-risk gravidas to the appropriate level of care, and thus minimize neonatal transfer which, of course, increases risk.

Following the publication of 'Toward improving the outcome of pregnancy', nationwide regionalization proceeded but with very individualistic rates and styles. To imply that within the USA there existed a uniform system of regionalized perinatal health care would be to grossly distort the truth.

## Models of regionalization across the USA

Although much activity directed at regionalization occurred across the USA in the 1970s, very little was published in peer-reviewed journals to document these efforts. One of the first such publications that described a statewide programme came from Iowa, a small state in the central midwestern part of the USA. This report, entitled 'Rural perinatology',<sup>4</sup> described a system developed to meet the needs of a state that possessed a relatively large number of hospitals with maternity services (141), but only one major referral centre, i.e. the teaching hospital at the University of Iowa.

In Iowa, the teaching hospital joined forces with the state health department, applied for and received a federal grant, and developed a system that, through intensive hospital visits, literally brought the resources of the University of Iowa Hospitals and Clinics to the rest of the state.<sup>4</sup> At that time (1973), the only neonatologists were at the teaching hospital, but it was unreasonable to assume all necessary referrals would be directed to the University of Iowa which was located in the south-east corner of the state. Accordingly, after all 141 hospitals were visited by the perinatal medical and nursing team of the Statewide Perinatal Care Program, the normal patterns of referral were determined and regional referral centres were established in the cities that were the naturally occurring referral centres for the state.

## A non-tertiary referral centre—a new concept

To establish referral centres across Iowa required special training and ongoing support of general paediatricians and obstetricians because of the unavailability of subspecialists (neonatologists and maternal–fetal medicine specialists). The perinatal team of the Iowa Statewide Perinatal Care Program, which has a central programme office at the University of Iowa, was responsible for the training of the general paediatricians and obstetricians. At the same time, nursing personnel were receiving education from the perinatal programme

nurses. This was achieved by a series of frequent hospital visits.

The hospital visits were literally a continuation of the initial survey visits to all 141 hospitals. The hospitals that were designated as regional centres initially received visits every three months; the small hospitals in their regional area were also visited but on a less frequent basis. This system appeared to be effective in lowering neonatal mortality across the state.<sup>5,6</sup> The programme still exists with each hospital in the state being visited on a regular basis by the Iowa Statewide Perinatal Care Program's perinatal team, consisting of a neonatologist, a maternal–fetal medicine specialist, an obstetric nursing consultant, a neonatal nursing consultant, and a perinatal nutritionist.

Currently, Iowa has been able to attract perinatal subspecialists to the state, and the University of Iowa is no longer the only tertiary facility. Three tertiary hospitals now exist and are complemented by seven regional level II centres. All but three of the regional level II centres have neonatologists on the staff, but only the tertiary centres have maternal–fetal medicine specialists.

The Iowa model worked well because of the absence of competition. In more populous areas, because of the inherent jealousies that competition brings, such a system would have been difficult to ordain. What did occur was a variety of systems largely centred around large metropolitan hospitals or teaching hospitals. Depending on the locale, some systems evolved that had clear-cut referral patterns and responsibilities, including outreach education of the referral area, but in other cases, the relationship was simply one of receiving referrals at a central hospital.

The ability of the network that evolved to meet perinatal needs was extremely variable. This was largely due to the inherent differences in the so-called level III centres. Some of these centres possessed all branches of surgical subspecialty and consultants in all paediatric subspecialties. Others had little more than a neonatologist, but were defined as tertiary centres (at time of writing, such variability still exists).<sup>7</sup>

Thus, the concept advanced in 'Toward improving the outcome of pregnancy' served as a useful ideal, but unfortunately, the factor that could not be anticipated and dealt with was competition and the jealousies that exist in any competitive system. Care as measured by neonatal outcome, aided by a widespread regionalization effort, did improve across the USA, but a uniform system that followed the ideal model set forth in 'Toward improving the outcome of pregnancy'<sup>3</sup> never developed.

## Bringing quality to a variable system

There is little question that given unlimited time, co-operation could have been developed throughout the various systems of perinatal health care that would have yielded an improved system overall. To some extent, legal pressures were already forcing the hand of the marginal level III centres to refer more readily to their more refined counterparts. However, this process was never allowed to evolve because of a major change in American medicine, namely the managed care movement.

## Managed care

The original concept of managed care was predicated on the concept of reducing healthcare costs by improving the health of patients served. Although the concept had inherent merit, it apparently could not yield sufficient savings to the third-party payers, and soon managed care became a system of managed costs. Physicians and hospitals were conscribed to become part of organizations that offered health care at a competitive cost. The goal was to provide health care at the lowest possible cost that would still be considered acceptable to the patient.

## Managed care and perinatal health care

To set the stage for the impact of managed care on perinatal health care, it is important to understand the status of the 50 states with regard to perinatal organization of care. E.R. Shaffer, working at the behest of the March of Dimes, provided a report entitled 'State Policies and Regional Neonatal Care: Progress and Challenges 25 Years after TIOP', (unpublished data, November 2001), about the various perinatal healthcare policies in the 50 states. She found only 30 states where levels of care could be reliably identified. Of these, only 12 still use the original 'Toward improving the outcome of pregnancy' definition for levels I, II and III, three states identified only one level of specialty care as a neonatal intensive care unit, and 15 states added levels of care beyond the three proposed by 'Toward improving the outcome of pregnancy'. Shaffer's report contained a complete description of the levels of care in each state.

What effect has managed care had, and will have on regionalized systems in the future? There are instances where neonates have been sent to a hospital that was not the most appropriate for the need, but which was dictated by the third-party

payer.<sup>8</sup> However, it is virtually impossible to accurately measure this effect since managed care contracts change on a yearly basis. The impact of third-party payers could become oppressive if the impact of the payers is not controlled. This might be controlled as follows.

- The ideal for care in the region must be stipulated through guidelines that define the various levels of care. If the guidelines clearly describe what is comprised, e.g. in a tertiary centre, comprehensive centre, or a regional level II centre, those hospitals that meet the guidelines will readily be identified. In other words, the guidelines will not restrict the hospitals, but will enable them to be recognized for their true level of functioning. It is essential that the government agency (health department) that has jurisdiction over the state or the region be responsible for the genesis of these guidelines.<sup>8</sup>
- The government agency that provides oversight for health care should designate an education/evaluation team to visit all hospitals in the state/region for the purpose of providing the most up-to-date education about what is appropriate perinatal health care. In most cases, the agency will be the state health department, but it may also be a city or county health department.<sup>9</sup> It is impossible to have existing referral centres provide such services in the absence of input by the governmental agency because of the effects of competition on the quality of the message provided to the hospital being reviewed. Simply put, to avoid the 'fox in the hen house' phenomenon, an outside agency must be involved.<sup>9</sup>
- In the USA, the legal system may intervene in situations when inappropriate referral for care results in a poor outcome. The American legal system has many faults, such as excessive litigation, but does have a positive effect on forcing physicians to consider the appropriateness of a referral, much as they would consider the appropriateness of the choice of an antibiotic.

Interestingly, in Iowa, where competition among the third-party payers and various organized systems of care (groupings of doctors and hospitals) is acute, there has been little evidence to show a decline in neonatal outcome in recent years. The ongoing monitoring/education system described above (Iowa Statewide Perinatal Care Program review team) has likely had a major impact on the ability of third-party payers to dictate care practices.

## Evaluating the impact of regionalization and monitoring the effect of managed care

An ideal system for monitoring outcomes would include mortality, morbidity and care appropriate to need.

Of the various perinatal mortality rates, the neonatal mortality rate is probably the most reasonable to follow. This is because fetal deaths occur in the non-hospital setting and go unreported, and postneonatal deaths are heavily influenced by social factors. The neonatal mortality rate best reflects hospital care including obstetric service, neonatal care and transport service.

Review of neonatal deaths should not be based on death certificate data, but rather on a true clinical review of the death with a final cause of death listed as the underlying clinical cause. For example, a 750 g, 24-week gestational age neonate dies at six days. The baby had severe respiratory distress syndrome and a grade II intraventricular haemorrhage. The death certificate listed respiratory failure as the sole cause of death. In truth, this baby died of the complications of respiratory distress syndrome and severe immaturity. Care can only be properly evaluated, and ultimately improved, by focusing on real causes.

Morbidity is very difficult to evaluate and compare. Every neonatal intensive care unit and regional system should be in a high-risk follow-up programme, and the outcomes within this system should be carefully monitored to assure that survival is not at the expense of meaningful life for the survivor.

Finally, care appropriate to need can be difficult to evaluate and tedious if done on a case-by-case basis. However, a quick and reasonably reliable method to assess the functioning of a hospital or system with regard to care appropriate to need is to track the births of very low-birthweight (VLBW) neonates.<sup>5,10</sup> In a regionalized system of care, the majority of such births should occur in the referral centre regardless of third-party payer involvement.

An annual review of birth and mortality data can provide a rapid evaluation of whether VLBW births are indeed occurring in the referral centres. Furthermore, coupling VLBW data with neonatal mortality data can also be useful.<sup>5</sup> The ratio of neonatal deaths as the numerator compared with the births of VLBW neonates as the denominator (the mortality risk ratio) should provide insight as to the overall quality of care provided by the hospitals.

Although evaluation of quality of care by virtue of the VLBW rate can be done quickly and yields

reasonably accurate result if the hospitals are truly functioning at the level that they claim, the birthweight-specific neonatal mortality rates of these hospitals must also be regularly reviewed as a second check to validate the VLBW data.

One of the difficulties of assessing whether care is appropriate to need harks back to the difficulty of assigning appropriate levels of care. In a system where all hospitals with neonatologists are automatically labelled as tertiary regardless of ancillary services, a high percentage of VLBW births could occur within the tertiary system. However, this figure would be misleading because, in cases where the smallest and sickest VLBW births occur in the marginal tertiary centres, care obviously would not be appropriate to need. Thus, in evaluating the system, the reviewer must be cognizant of the true functioning level of the hospitals being evaluated.

### A slight correction to standard birth and mortality data

In the USA, as with most national health data, neonatal deaths are assigned to the hospital of birth. This may lead to a distorted view of the capability of referral hospitals if referring hospitals in the region chronically refer gravidas late in the course of a complication that leads to a poor neonatal outcome. To correct for this possibility, a neonatal mortality rate for all births can be compared with a corrected neonatal mortality rate where deaths from late neonatal transfers are assigned to the hospital or origin.<sup>11</sup>

### The future

Regionalization of perinatal health care will continue to exist in many, if not most, parts of the USA because most rural areas and other areas of low population density will not be influenced by competition for referrals. However, in areas that are served by competing hospitals and/or systems of care, the phenomenon of deregionalization will continue to occur.<sup>7</sup>

Deregionalization is a term that was first heard in the late 1980s.<sup>12</sup> It refers to a process of moving away from referrals directed to referral centres that are capable of providing the highest quality of care. Rather, care is provided in hospitals that are willing to offer the care, but lack expertise at the level of the referring centres. As noted before, the competing hospital may have the same numerical designation as the quality referral centre. This becomes very difficult for the public to comprehend, since lay people are not aware of the true

functioning level of hospitals and thus accept decisions regarding locale of care without question.

Potential solutions to the problem are several and have been outlined in previous publications.<sup>8,9</sup> Briefly, academic medical centres should become more actively involved in outreach education that will bring a clear understanding about the value of quality perinatal health care. Also, the departments of public health should establish guidelines that clearly elaborate the level of functioning of a hospital that corresponds to a numerical designation.

Furthermore, third-party payers should be required to inform their clientele about the level of functioning of a hospital which they use as referral sources. If a higher level of care is readily available in the same region, patients should know why it is not being utilized. This latter suggestion may seem extreme and is intended to be so. If the quality aspects of a healthcare system are not protected and preserved, the system will not survive. The USA has benefited mightily from the highly specialized care provided by academic medical centres. These centres are also the source of the future generations of healthcare providers. If these centres are deprived of the patients that should come to them by dint of the nature of the care the patients require, academic medical centres cannot endure.

Regionalization evolved to make newer and better services available to all patients regardless of their locale. This was true in the late 1960s and early 1970s when the first regional perinatal programmes were developed. Patients still need the best care as close to their homes as possible, thus the need for regionalized services still exists.

### Research directions

- I believe the direction will largely be determined by the impact of managed care and third-party payers in general.

### References

1. Luft HS, Bunker JP, Enthoven AC. Should operations be regionalized? *N Engl J Med* 1979;301:1364–9.
2. Longmier WP, Mellinkoff SM. Regionalization of operations. *N Engl J Med* 1979;301:1393–4.
3. Committee on Perinatal Health. Toward improving the outcome of pregnancy: recommendations for the regional development of maternal and perinatal health services. White Plains, NY: National March of Dimes Birth Defects Foundation, 1976.
4. Hein HA, Christopher MC, Ferguson NN. Rural perinatology. *Pediatrics* 1975;55:769–73.

5. Hein HA. Evaluation of a rural perinatal care system. *Pediatrics* 1980;**66**:540–6.
6. Hein HA, Burmeister LF. The effect of ten years of regionalized perinatal health care in Iowa, USA. *Eur J Obstet Gynecol Reprod Biol* 1986;**21**:33–48.
7. Gould JB, Marks AR, Chavez G. Expansion of community-based perinatal care in California. *J Perinatol* 2002;**22**:630–40.
8. Hein HA. Regionalization of perinatal health care—a lesson learned but lost. *J Perinatol* 1999;**8**:584–8.
9. Hein HA. Perinatal outreach education—the role of academic medical centers. *J Pediatr* 2002;**141**:151–2.
10. Lee K, Paneth N, Gartner LM et al. The very low-birth-weight rate: principal predictor of neonatal mortality in industrialized populations. *J Pediatr* 1980;**97**:759.
11. Dooley SL, Freels SA, Turnock BJ. Quality assessment of perinatal regionalization by multivariate analysis: Illinois, 1991–1993. *Obstet Gynecol* 1997;**89**:193–8.
12. Butterfield LJ. The nursery network: an option to deregionalization. *J Perinatol* 1987;**7**:1.

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

