Evaluation of hospital resources for perinatal assistance in Brazil

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Abstract

Objective
To verify the adequacy of hospital resources for perinatal care in Belo Horizonte, MG, Brazil in 1996.

Methods
This is a cross-sectional study conducted encompassing all the 28 maternity-hospitals in the city of Belo Horizonte, capital of the State of Minas Gerais, Brazil. A model of evaluation denominated "*Níveis de Complexidade e Segurança em Potencial de Unidades Perinatais de Hospitais-Maternidade*" *[Levels of Complexity and Potential Safety in Maternity-Hospitals]*. This model is based on the evaluation of three major areas in the hospital: general structure, perinatal clinical infra-structure and resources available in perinatal units. Two scores involving these three areas were created. When evaluating low risk perinatal care, the score may sum to a total of 1,000 points. On the other hand, when high to medium perinatal risk care is considered, the score may sum to 2,000 points. Hosptals that scored more than 500 points were classified in two levels: I-A and I-B (for low risk); and six levels I-A through III-B (for medium/high risk).

Results
Five hospitals were classified as level 0 according to the low risk score, that is, they were not considered adequate to assist any delivery. When the medium/high risk score was employed, a total of seven hospitals were considered inadequate to assist any delivery.

Conclusions
This evaluation model was capable of classifying hospitals according to available infra-structure for perinatal care.

INTRODUCTION

A rate of infant mortality in the municipality of Belo Horizonte, State of Minas Gerais, decreased from 54.1/1,000, in 1981, to 31.4/1,000, in 1996. In 2001, it was down to 14.1/1,000, principally due to the resolution of post-neonatal deaths. However, the rate of neonatal deaths is still high, being responsible for more than 50% of the infant mortality.* This behavior has also been reported in other studies.[8] The rate of perinatal mortality has been used as an indicator of the quality of health care. However, it suffers the influence of several confounding factors in the health services and, therefore, may not be a sensitive and reliable quality indicator.[17] Furthermore, the information available on death certificates is short of the desirable level. [6]

Some authors have demonstrated that unfavorable hospital conditions are prejudicial to newborn, even to those of normal weight. Once it is born, mortality of the low-weight newborn (LWNB) may no longer be attributed to prenatal care, but to assistance during

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delivery and afterwards.[27] In Western countries, perinatal mortality could be reduced in up to 25% with improvements in maternal and perinatal assistance.[4,20] In Belo Horizonte, a study undertaken in 1993 indicated that 68.5% of the neonatal deaths occurred in hospitals that didn't have adequate neonatal assistance.[1] Another study undertaken in 1999 indicated that, according to Wigglesworth's classification and utilizing 1,000 grams birthweight as a reference for fetal vitality, 60% of the neonatal deaths could have been prevented.[12,13] The "rate of evitable deaths" in the Northeast was 40% and it was proposed as an indicator of the quality of the local health care system.[9]

In Brazil, according to data from the *Sistema de Informações sobre Nascidos Vivos* (SINASC) [Information System on Live Births], only 3.2% of the births occur outside the hospital environment.* Therefore a continuous and permanent evaluation of hospital infrastructure has become imperative.

There are minimal technical standards which must be met in order for maternity hospitals to function properly. In the majority of the developed countries – such as the United States, New Zealand and Australia – these standards are guaranteed by Hospital Accrediting Programs. In Brazil, these programs are still incipient, being restricted to only a few states of the federation, such as Parana and Sao Paulo.**

The absence of an effective Hospital Accrediting Program in Belo Horizonte, as well as in the rest of the country, led the authors to elaborate a duly tested model of evaluation of perinatal units in maternity hospitals.

The objective of the present study was to evaluate the infrastructure of maternity hospitals and classify them according to this model.

METHODS

A questionnaire with 300 variables was applied in all 28 maternities in Belo Horizonte, in 1996. This questionnaire addressed three areas: a) general hospital infrastructure; b) clinical perinatal infrastructure and c) physical, technological and human resources in the perinatal units.

Initially, a pre-test was undertaken and, following that, a pilot study conducted in four maternity hospitals with distinct levels of complexity.*** In the pilot study, the adequacy of the questionnaire was evaluated, in terms of the sequence of questions asked, as well as their format and clarity. The variables that were less subject to observational errors and which were more capable of differentiating the hospitals among themselves were maintained in the final version of the questionnaire. After the pilot study was completed, the manual for filling out the questionnaire was elaborated.

Information on the questionnaire was obtained by means of direct observation *in loco,* in each of the maternities, by four investigators: a main investigator, who was an intensive care pediatrician and neonatologist with formal training and experience in hospital administration; a nurse with experience in the field of hospital audits; an obstetrician with experience in service management and a neonatologist pediatrician. All the members of the team had experience in hospital evaluation and received specific training for this study.

Information obtained by means of direct observation includes verifying the existence, number and quality of physical and technological resources (such as neonatal transport incubators and mechanical respirators, for example) as well as the conditions under which they were utilized. The general hospital infrastructure was also evaluated: clinical analysis laboratories, radiology, ultrasound, transfusion units, pharmacy, laundry, milk dispensary and electric energy generator.

Questions concerning human resources within perinatal assistance attempted to identify the number of professionals, the period of time they were present at the meternity – shifts (mornings, afternoons, nights and weekends) – of at least 18 professional categories (for example, obstetricians, pediatricians, nurses and physiotherapists)and were answered by the head of the sectors and services.****

Coherence and consistency of the shifts, for example, whether or not the member of a specific category was actually physically present during his/her 24-hour shift, including weekend shifts, was verified.

Evaluation of the committee to control hospital infections limited itself to the verification of the minutes of the meetings of the *Comissão de Controle de Infecção Hospitalar* (CCIH)[Committee for the Control of Hospital Infections] and to the notices placed in critical areas of the hospitals with recommenda-

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Table 1 - Classification of the maternity hospitals according to the level of complexity and potential safety of the perinatal units. Belo Horizonte, Minas Gerais State, 1996.

Total scores*	Classification
0 to 500	Level 0
501 to 750	Level I-A
751 to 1,000	Level I-B
1,001 a 1,250	Level II-A
1,251 a 1,500	Level II-B
1,501 a 1,750	Level III-A
1,751 a 2,000	Level III-B

*Up to 1,000 points at most = habitual risk; up to 2,000 points at most = medium/high risk

tions. Resolutions of the hospital's Board of Directors with the nominations of its members according to legislation and/or the Ministry of Health's recommendations were also taken into consideration.

The average length of time necessary to register information concerning the 300 variables included in the questionnaire was eight hours.

In order to quantify the data concerning hospital infrastructure so as to classify the maternity hospitals in Belo Horizonte, two scores were developed: one of these utilized a maximum of 1,000 points to evaluate the potential security of care received during pregnancy, labor and delivery in habitual risk births (pregnant women/newborns clinically diagnosed as minimal risk); and another score with a maximum of 2,000 points, used in evaluating the potential security of care in medium/high risk pregnancies. Each of the 300 variables received between 5 and 50 points, corresponding to its importance as a criterion of "potential safety" in the maternity hospitals, considering the three areas being evaluated. Items considered essential and complete for perinatal care were assigned the largest number of points.*

A classification/evaluation system was elaborated, being denominated *níveis de complexidade e segurança em potencial para unidades perinatais de hospitais-maternidade* (NCSPHM) [Levels of complexity and potential security for perinatal units in maternity hospitals]. Seven strata were utilized to evaluate the scores obtained by the hospitals (see Table 1). The first strata, which includes the hospitals that obtained 500 points, corresponds to 25% of those classified within the 2,000 point score total attributed to medium and high risk care, and 50% of the maximum 1,000 point score total attributed to habitual risk care. The hospitals were then classified according to the total number of points they received. The levels, from I to III, were subdivided in A and B, corresponding to a division in quartiles, so as to better classify and differentiate the hospitals from one

another, as in other scores. Thus, a hospital classified as B has greater complexity and, possibly, greater potential security. Since the classification of care at delivery for habitual risk births has, at most, a 1,000 point score, within the criteria defined below, hospitals evaluated for this type of care may only attain, at most, the I-B level. On the other hand, when evaluating care for medium/high risk births, the hospitals can attain a maximum of 2,000 points and may be classified, at most, as level III-B.

In order to guarantee secrecy, each of the maternities received a code number ranging from 1 to 28. Data were stored in a computer databank, utilizing the Epi Info 6.04 program.

This study was approved by the *Comitê de Ética em Pesquisa da Universidade Federal de Minas Gerais* [Research Ethics Committee of the Federal University of Minas Gerais]. (Parecer COEP 104/98 de 3/2/99).

RESULTS

The distribution of points in the areas of general hospital infrastructure of the 28 maternity hospitals of Belo Horizonte in the year 1996 may be observed on Table 2. The areas in which maternities displayed greatest variability were general hospital infrastructure (area A) and physical, technological and human resources of the perinatal units (area C). When care for medium/high risk births was evaluated, the physical, technological and human resources of the perinatal units (area C) presented the greatest potential for differentiating the institutions and determining their final classification.

The hospital which were classified in the intermediary level, I-A for habitual risk, I-A, II-A e II-B for medium/high risk presented delimited structural deficiencies, some of which were very serious. If some of these deficiencies/variables (see Table 3) with a high potential for differentiating the institutions, for example, complete hygienization of the nursery, had been used as a criteria for exclusion, 23 hospitals (82%) would have been considered level zero.

Even the hospitals that attained the highest level of classification (I-B; III-A e III-B), with respect to the evaluations for habitual or medium/high risk, presented this deficiency. The committees for control of hospital infections undertook an active search for infections in all but one of the hospitals investigated and, in 26 hospitals, they conducted inspections of the antibiotics in stock.

*The questionnaire with the number of points given to each variable according to both scores may be obtained, upon request, from the first author of this study.

Table 2 - Distribution of the points, grouped together according to areas evaluated, among the 28 maternity hospitals of Belo Horizonte, MG, 1996.

Hospital codes	Habitual risk* Áreas				Hospital codes	Médium/high risk* Áreas			
	A (325)**	B (85)**	C (590)**	Total (1000)**		A (405)**	B (175)**	C (1420)**	Total (2000)**
25	83	40	175	298	25	86	40	155	281
12	168	55	185	408	12	178	55	165	398
14	160	50	225	435	14	183	50	165	398
10	145	55	245	445	24	176	80	185	441
6	130	55	265	450	10	160	55	245	460
24	140	80	285	505	6	155	55	265	475
3	203	55	295	553	7	173	85	240	498
7	158	85	335	578	15	236	85	215	536
19	170	80	330	580	11	252	80	250	582
11	202	80	300	582	9	236	85	285	606
15	200	85	310	595	3	233	55	350	638
9	180	85	345	610	19	226	80	350	656
20	190	85	385	660	20	265	85	310	660
13	180	80	425	685	13	254	120	675	1049
16	315	55	355	725	2	382	80	695	1157
17	315	70	420	805	21	405	120	700	1225
21	325	80	425	830	16	385	105	760	1250
28	325	80	430	835	23	387	120	795	1302
23	315	80	445	840	17	384	110	835	1329
5	303	80	500	883	27	405	125	800	1330
27	325	85	475	885	5	382	120	870	1372
1	325	80	485	890	18	405	120	865	1390
18	325	80	490	895	8	375	135	995	1505
8	315	85	505	905	28	405	170	1075	1650
22	315	80	540	935	22	387	170	1215	1772
2	310	80	550	940	1	405	175	1200	1780
26	325	80	540	945	4	402	175	1225	1802
4	325	85	545	955	26	405	175	1335	1915

A: general hospital infrastructure; B: perinatal clinical infrastructure; C: physical, technological and human resources of the perinatal units
*Classification of pregnant women/ newborn
**Total number of points that can be scored

The rest of the variables that appear in Table 3, such as the existence of a milk dispensary and intensive care incubators; electric generators in critical sectors; oxygen analyzers (which analyze the fraction of inspired oxygen) in the nurseries and a anesthetic recovery room, were present in all the hospitals classified in category III-B.

The final classification/evaluation (sum of the scores in areas A, B and C) of the 28 maternity hospitals in terms of habitual and medium/high risk respectively may be observed on Figures 1 and 2. Five hospitals (17.9%) (see Figure 1) did not provide what was considered the minimal conditions of complexity and potential security (CCPS) to care for women during habitual risk deliveries and births or for habitual risk newborns (level 0 – a score of less than 500 points). Another 13 hospitals (46.4%) presented CCPS scores considered adequate (level IB – scores higher than 750 points). Ten maternity hospitals (35.7%) are in an intermediary position (level IA – scoring from 501 to 750 points).

When the score developed for evaluating hospitals with a level of complexity which should qualify them to care for medium/high risk births and newborns (maximum of 2,000 points) is taken into consideration (see Figure 2), two more maternity hospitals (25.0%) are classified as level zero (see Figure 1). Six

maternity hospitals (21.4%) (level I-A) presented CCPS slightly higher, although still clearly unsatisfactory for this level of care. The nine maternity hospitals (32.1%) classified as levels II-A and II-B presented what may be considered intermediary CCPS in terms of care for medium/high risk births and newborns. The level III-A and III-B maternity hospitals, a total of two and three hospitals, respectively, presented adequate conditions of care. None of the hospitals in this study were classified in the I-B category.

DISCUSSION

The decision to develop this questionnaire was motivated by the lack of a national protocol for evaluating maternity hospitals according to a score. Existing studies evaluate several items of the infrastructure and of human resources, but do not utilize scores which make it possible to undertake a "global" evaluation of the maternities. That is, the pre-existing methods may indicate the percentage of maternities in which a specific resource is or is not available, but do not establish a hierarchical system among these maternities.[3,16,19,20,22] Neither does the *Manual Brasileiro de Acreditação Hospitalar* [Brazilian Hospital Accreditation Manual], provide a scoring system.[18]

Some authors believe that the evaluation of hospital

Table 3 - Resources that presented the greatest capacity of differentiating the 28 hospitals. Belo Horizonte, 1996.

Resource	Existent		Non existent	
	N	%	N	%
Complete higienization of the nursery	5	17.8	23	82.2
Complete Neonatal Resuscitation Unit	10	36.0	18	64.0
Milk dispensary	11	39.0	17	61.0
Nursery Intensive Care Unit Incubators	11	39.0	17	61.0
Nursing care / 24 hours at delivery	14	50.0	14	50.0
Nursing care /24 hours in the nurseries	14	50.0	14	50.0
Anesthetic recovery room	14	50.0	14	50.0
Analyzer of the fraction of inspired oxygen in the nurseries	14	50.0	14	50.0
Electric generator in critical sectors	14	50.0	14	50.0
Portable X Ray available in the nurseries	15	53.6	13	46.0
Pediatricians in the nurseries 24 hours/day	17	60.7	11	39.3
Nurse attendant's care 24 hours/day in the nurseries	17	60.7	11	39.3
Laundry with a physical barrier in use	17	60.7	11	39.3
Pediatric care available for 24 hours at delivery.	17	60.7	11	39.3
Nurse attendant's care 24 hours/day in the nurseries at delivery.	17	60.7	11	39.3
Glucose meter in the nurseries	18	64.3	10	35.7

infrastructure should not be undertaken in an isolated manner, for, despite the fact that it is capable of guaranteeing safety in care during birth and in the postpartum period, for both the mother and the newborn, diminishing the probability of unfavorable results, it does not guarantee the quality of the processes involved.[1,7,17] For this reason, the expression "in potential" appears in the this study, indicating that the presence or absence resources (infrastructure), but not the process of producing care and/or the results, such as rates of mortality, among others were analyzed. Among the existing models of hospital evaluation, the *obstetrical quality indicators and data collection*, created by a multi-professional and inter-institutional pan-European network, evaluates 50 items associated to childbirth, with much greater emphasis on results than on infrastructure.[10] In the model proposed by Le Fevre et al,[15] utilized by the *National Institute of Child Health and Human Development*, infrastructure is hardly taken into consideration, for the central line of evaluation is the qualification of human resources. Some studies involving results have also been conducted in Brazil, generally these utilize rates of mortality, more frequently rates of infant mortality. In the Central-Western region of Brazil, it was observed, by crossing information from different databanks, utilizing the technique of logistic regression, that being born in a public state hospital was a risk factor for mortality in the neonatal period. This result may reflect some kind of structural deficit.[19] In Sao Luis, Maranhao State, it was stated that the expressive increase in neonatal mortality from 1995 to the present indicates a decrease in the quality of obstetric and neonatal care. This, in turn, is attributed to the high rates of cesarean sections and overcrowding in the nurseries.[20]

On the other hand, evaluation of hospital infrastructure, even if in na isolated manner, is important, for adequate foundations of the health services are associated to the reduction of maternal and infant mortality.[5,11,14,23-25] Furthermore, in Brazil, hospital infrastructure is still an important concern; it is for this reason that studies tend to evalluate this item in more detail.[3,16,22] In the
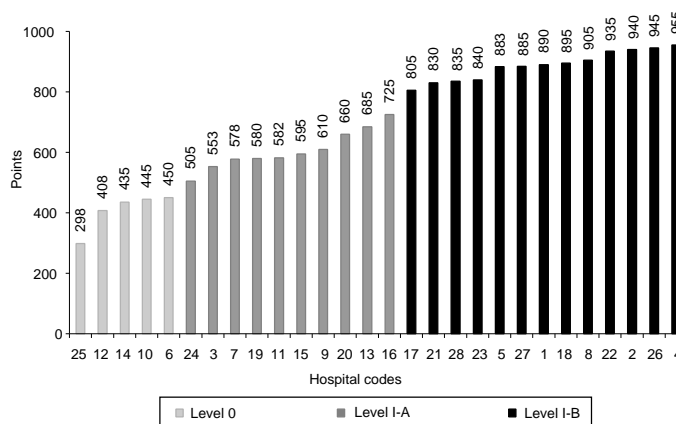

Figure 1 - Levels of complexity and potential safety in care for pregnant women and neonates classified within the habitual risk category in Belo Horizonte maternity hospitals, 1996.
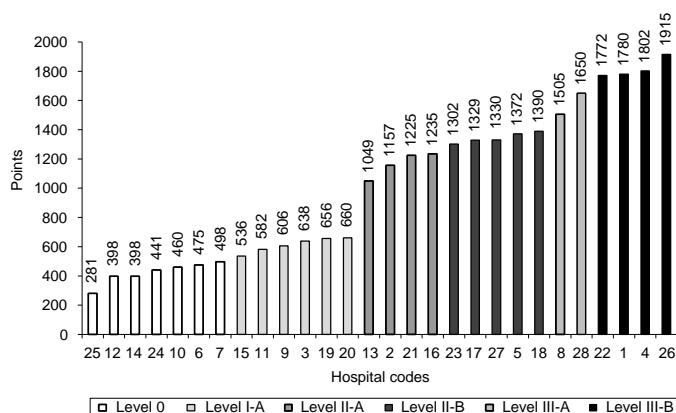

Figure 2 - Levels of complexity and potential safety in care for pregnant women and neonates classified within the medium/high risk categories in Belo Horizonte maternity hospitals, 1996.

study conducted by the *Conselho Regional de Medicina do Estado de São Paulo* [São Paulo State Regional Council of Medicine],[3] it was found that only 24% of the maternities possessed complete reanimation units and only 30% had pediatricians on shift in the delivery room; 65% of the nurseries didn't employ pediatricians as part of the regular daily staff of the nurseries. Furthermore, many maternity hospitals presented deficiencies with respect to equipments, such as portable X-rays, incubators, and radiant warmers.

Analysis of Figures 1 and 2 reveals that perinatal care in Belo Horizonte, in the year 1996, was delivered in maternity hospitals that were heterogeneous from the perspective of their foundations, some didn't have the minimum infrastructure required to care for women during delivery or for their low risk newborn. These hospitals, classified as level zero, presented serious structural deficiencies for whatever type of care being delivered, such as the absence of a neonatal resuscitation unit, of a complete higienization unit in the nursery, of a milk dispensary, of electric generators in critical sectors, of qualified human resources for immediate and sequential treatment of the newborn and of pregnant women as well as for women during the puerperium. It has already been shown that the absence of complete hygienization in the nurseries is an important risk factor for the occurrence of episodes of hospital infections, which, in turn, is the main determinant of neo-natal morbi-mortality.[17] Furthermore, activities undertaken by Committees for the Control of Hospital Infection are not sufficient to guarantee the quality of perinatal care.

Patients attended in these hospitals are certainly exposed to unnecessary and evitable risks. The fact that maternity and neonatal care is not organized in a hierarchical system greatly increases the risks for the population for any one of the 28 maternity hospitals delivered care to both women in labor and newborn classified as high risk. The existence of a complete neonatal resuscitation unit, found only in 10 hospitals (36.0%), demonstrates the inadequacy of the hospital network. The fact that obstetric care is not regionalized and hierarchically organized in the metropolitan region of Rio de Janeiro was associated with evitable perinatal mortality.[12,13,21] Another indicator of the precariousness of perinatal care as practiced in Belo Horizonte is the rate of maternal mortality, which, was 71.8 per 100,000 live births in 1998, whereas, in developed countries, it is less than 10 per 100,000 live births.[15]

One of the limitations of the present study is that a maternity hospital which does not possess an important item in perinatal care may have a higher score than another one that has this item because it received more points on other items. A concrete example is the fact

that one of the maternities, which did not have a complete resuscitation unit, accumulated a sufficient number of points on other items to be classified as level III-B. On the other hand, it was verified that this hospital presented adequate infrastructure with respect to the other items, justifying its high score, which distinguishes it from the other hospitals. In this case, eventual financial resources could be directed to this hospital so that it could install a complete neonatal resuscitation unit. If a process of regionalization and hierarchical organization of maternity and neonatal care takes place, this hospital would occupy a prominent position.

Another limitation was the fact that rigor with respect to the collection of data in the three areas was not homogeneous, for the questions concerning human resources were answered by the heads of the respective departments and services; evaluation of the Committees for the Control of Hospital infection was based on the minutes of the meetings; and evaluation of general and perinatal infrastructure, as well as physical and technological resources was based on direct observation by the team of investigators. However, this does not invalidate the study, for the same methodology was applied to all maternity hospitals.

The authors consider that the methodology of this study corresponds to the proposed objectives, making it possible to classify the maternity hospitals of the municipality. This does not occur in the majority of national studies in which a scoring system is utilized.[3,16,18,22] Furthermore, the model proposed may make it easier to identify the maternity hospitals with less infrastructure and human resources, which scored fewer points and, for this reason, are in need of immediat intervention/evaluation. An external indicator of the adequacy of the present study is exemplified by the fact that two years after the study was concluded, in 1998, the health administrator of the municipality of Belo Horizonte, redirected care for pregnant women in this city. The five hospitals which were classified as level zero for habitual risk in this study were removed from the *Sistema Único de Saúde* [Brazilian Public Health System] after being re-evaluated by technical personnel from the Municipal Department of Health of Belo Horizonte. Another external indicator was the utilization of the score system of this study to evaluate maternity hospitals in Goiania, GO, in the year 2003.[2]

The lapses encountered in this study may be corrected by attributing different scores to the given variables and by including and/or excluding other variables.

As other authors have stated, "improvements in the coverage and particularly in the quality of perinatal

care are urgently needed".[26] It is necessary to establish a permanent program of Hospital Accreditation, capable of evaluating processes and results as well as structures and structural deficiencies of the hospitals, and it could be based on the model presented in this study.

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