Management of Infants of Diabetic Mothers

Leandro Cordero, MD; Sergio H. Treuer, MD; Mark B. Landon, MD; Steven G. Gabbe, MD

Objective: To describe the clinical outcome of infants born to mothers with gestational diabetes mellitus (GDM) and preexisting insulin-dependent diabetes mellitus (IDDM).

Setting: A tertiary care regional perinatal center with a specialized diabetes-in-pregnancy program.

Design: Case series.

Results: Five hundred thirty infants were born to 332 women with GDM and 177 women with IDDM. Thirty-six percent of these 530 newborns were large for gestational age, 62% were appropriate for gestational age, and only 2% were small for gestational age. Seventy-six (14%) of all infants were born before 34 weeks’ gestation, 115 (22%) between 34 and 37 weeks of gestation, and 339 (64%) at term. Two hundred thirty-three infants (47%) were admitted to the neonatal intensive care unit due to respiratory distress syndrome (RDS), prematurity, hypoglycemia, or congenital malformation. Hypoglycemia (more common among infants of maternal diabetic classes C through D-R) was documented in 137 (27%) of all newborns. One hundred eighty-two infants (34%) had RDS of varying severity. Polycythemia (5% of infants), hyperbilirubinemia (25%), and hypocalcemia (4%) were other morbidities present. Two hundred forty-four infants were admitted for routine care and enteral feedings. Forty-three of these newborns required subsequent transfer to the neonatal intensive care unit for treatment of hypoglycemia (16 cases), RDS (19 cases), or both (8 cases). Routine care failures were more common among infants whose mothers had advanced diabetes, but less frequent among breast-fed infants.

Conclusions: With modern management, fewer morbidities can be expected in infants of diabetic mothers. Those infants born to women with IDDM remain at risk for hypoglycemia, which can be treated in one half of the cases by enteral feedings alone. The majority of cases of RDS are mild and require short admissions to special care nurseries. Optimal care of infants of diabetic mothers is based on prevention, early recognition, and treatment of common conditions. Severe congenital malformations, significant prematurity, RDS, recurrent hypoglycemic episodes, and asymptomatic infants of women with advanced IDDM should be admitted to special care nurseries. Breast-feeding among women with GDM and IDDM should be encouraged.


Increased awareness, screening, and identification have led to a greater number of successful pregnancies among women with gestational diabetes mellitus (GDM) and preexisting insulin-dependent diabetes mellitus (IDDM). It has been estimated that more than 100,000 infants of diabetic mothers are born every year in the United States. Although perinatal mortality among this group has declined, excess neonatal morbidity remains a significant challenge. Suboptimal prenatal care along with poor maternal glycemic control, vasculopathy, infection, and pregnancy-induced hypertension are factors associated with poor perinatal outcome. Congenital malformations, macro somia, respiratory distress syndrome (RDS), hypoglycemia, hyperbilirubinemia, and hypocalcemia are some of the conditions most frequently diagnosed in the offspring of diabetic women. Successful management of infants of diabetic mothers is based on prevention or early recognition combined with treatment of these complications. For example, neonatal hypoglycemia, known to affect 5% to 30% of infants of diabetic mothers, can be avoided in some cases by early breast- feedings or formula- feedings and/or by intravenous dextrose administration.

Comprehensive care of pregnant women with diabetes mellitus has been extensively described, yet guidelines regarding the care of the infant are less well established. The purpose of this investigation was to characterize the clinical outcome for a large cohort of infants of diabetic mothers delivered during a 3-year period, and to examine the efficacy of our institutional diagnostic and therapeutic approach to their care.

RESULTS

Between January 1, 1994, and December 31, 1996, 509 women with diabetes mellitus were delivered of 491 singletons, 15 sets of twins, and 3 sets of triplets. Three hundred ninety-four (77%) of the women were...
PATIENTS AND METHODS

The study population consists of mothers and their infants born at The Ohio State University Hospitals from 1994 through 1996. Demographic and clinical characteristics were obtained from our database and medical records.

Classification, diagnosis, treatment, and care of pregnant women with diabetes mellitus in our institution is based on specific recommendations. Fetal assessment for insulin-dependent women consists of twice-weekly nonstress testing beginning at 32 weeks, unless other risk factors are present. Women with diet-controlled GDM (class A1) undergo nonstress testing for specific risk factors or when they reach 40 weeks. Women with insulin-requiring GDM (class A2) are managed similar to women who have preexisting diabetes without vascular disease.

Our institutional guidelines establish that infants of diabetic mothers delivered before 34 weeks’ gestation and those with significant major malformations or respiratory distress, regardless of gestational age, be admitted directly to the neonatal intensive care unit (NICU) from the delivery room. All newborns admitted to the NICU are prescribed 10% dextrose in water, 80 mL/kg per day, intravenously if their birth weight is more than 1000 g, and 5% dextrose in water, 100 mL/kg per day, if less than 1000 g. Asymptomatic infants whose mothers have preexisting diabetes also receive intravenous dextrose supplementation in the NICU, and those born to women with GDM who do not fall into the above-described categories are admitted to the well-baby nurseries for routine care and breast- or formula-feeding. Infants who develop complications that prompt subsequent admission to the NICU are considered routine care failures. Breast-feeding is started shortly after delivery, but a liberal formula supplementation is in effect to prevent hypoglycemic episodes.

Respiratory distress syndrome was arbitrarily classified into nonspecific mild or nonspecific moderate (clinical signs and/or supplemental oxygen requirements lasting less than 6 or less than 48 hours, respectively), and hyaline membrane disease, transient tachypnea, and persistent pulmonary hypertension of the newborn were diagnosed by clinical and radiological signs. Blood glucose screening was performed with chromogen reagent strips (AccuChek Advantages, Boehringer Mannheim, Indianapolis, Ind) by read a reflectance meter (AccuData GTS, Boehringer Mannheim), and true serum glucose was measured by the standard glucose oxidase method. Hypoglycemia was defined as mild if the true serum glucose concentration was 1.7 to 2.2 mmol/L (30-39 mg/dL), moderate if 1.1 to 1.6 mmol/L (20-29 mg/dL), and severe if less than 1.1 mmol/L (<20 mg/dL). Glucose was administered orally or intravenously (a slow infusion of 10% dextrose in water, 2 mL/kg, followed by 100 mL/kg per day) to all infants with or without symptoms provided that serum glucose concentration decreased to less than 2.2 mmol/L (<40 mg/dL). Polycythemia was defined as a peripheral venous hematocrit greater than 0.65, and hyperbilirubinemia was defined as an indirect bilirubin serum level greater than 204 µmol/L (12 mg/dL) and/or any hyperbilirubinemia requiring treatment (phototherapy). Hypocalcemia was defined by total serum calcium values lower than 1.50 mmol/L (6 mg/dL) or ionized calcium levels below 1.00 mmol/L (2 mEq/L).

Patients were classified into large for gestational age (LGA), appropriate for gestational age (AGA), and small for gestational age (SGA), according to the relationship between intrauterine growth and gestational age. Proportionate vs disproportionate growth was determined by ponderal index. Infants whose birth weight was at least 4000 g regardless of gestational age were defined as macrosomic.

The Student t test for independent samples was used to compare continuous variables. The χ² test was used to test differences in all categorical variables. The Mann-Whitney U test was used to compare noncategorical variables. Forward stepwise logistic regression was used to evaluate the contribution of maternal diabetes class, gestational age, birth weight, sex, mode of delivery, Apgar scores, macrosomia, breast-feeding, LGA, and SGA (dependent variables) in the prediction of routine care failure (independent variable). All statistical tests were 2 tailed and a P value less than .05 was considered significant.

NICU ADMISSIONS

Two hundred forty-seven (47%) of all infants required admission to the NICU (Figure). The number of patients ranged from 36% for class A1 to 68% for class D-R. Included were 76 infants whose gestational age was 33 weeks or less, 22 infants with congenital malformations, 10 patients with white, 97 (19%) were black, and the remaining 18 (3%) either Asian or Hispanic. Maternal age ranged from 16 to 44 years, with 392 (77%) of the mothers in the 20- to 36-year age group. Approximately one third of all mothers were primigravidas. Further clinical and demographic information for the study population is presented in Table 1.
miscellaneous conditions (apnea, cardiac arrhythmias, poor feeding, neonatal depression), and 103 infants with gestational age of 34 weeks or more with RDS. Hypoglycemia was the only admission diagnosis in 32 infants.

**RESPIRATORY DISTRESS**

One hundred eighty-two (34%) of the 530 infants presented with RDS of varying severity (Table 2). Respiratory distress syndrome, by maternal diabetes classification, was present in 25% of A1, 38% of A2, 35% of B, 47% of C, and 56% of D-R. Of all infants with RDS, 84 (46%) had nonspecific mild RDS, 41 (23%) had nonspecific moderate RDS, and 13 (7%) had transient tachypnea. All these 3 forms of delayed transition combined accounted for 76% of all the RDS cases. Hyaline membrane disease was found in 34 (6%) of the infants and persistent pulmonary hypertension was found in 10 (2%). Sixty-five (36%) of the 182 infants with RDS were treated with mechanical ventilation. All infants with hyaline membrane disease received exogenous surfactant (beractant [Survanta]).

**CONGENITAL MALFORMATIONS**

Twenty-six (5%) of the 530 infants presented with congenital malformations, and 22 of these infants required admission to the NICU. Among 249 infants born to mothers with class A1 diabetes, the following diagnoses were made: ring Y chromosome (n=1), cleft palate (n=2), ileal atresia (n=1), diaphragmatic hernia (n=1), duodenal atresia (n=1), gastrochisis (n=1), hydrocephalus (n=1), myelomeningocele (n=1), hydronephrosis (n=2), hypoplastic kidneys (n=1), and Sturge-Parke-Weber syndrome (n=1). One patient with hypoplastic left ventricle and one with congenital hydrocephalus were born to mothers with diabetes class A2. One hundred seventy-eight infants were born to mothers with class A1 diabetes, the following diagnoses were made: atrial septal defect (n=2), ventricular septal defect (n=2), and ventricular septal defect (n=2).

**INTRAUTERINE FETAL GROWTH**

One hundred ninety-two (36%) of the 530 infants were LGA, 327 (62%) were AGA, and only 11 (2%) were SGA (Table 1). Distribution according to maternal diabetic classification of C, and 56% of D-R. Of all infants with RDS, 84 (46%) had nonspecific mild RDS, 41 (23%) had nonspecific moderate RDS, and 13 (7%) had transient tachypnea. All these 3 forms of delayed transition combined accounted for 76% of all the RDS cases. Hyaline membrane disease was found in 34 (6%) of the infants and persistent pulmonary hypertension was found in 10 (2%). Sixty-five (36%) of the 182 infants with RDS were treated with mechanical ventilation. All infants with hyaline membrane disease received exogenous surfactant (beractant [Survanta]).
Twenty-two (30%) of the macrosomic infants had RDS, which ranged from mild (10 cases) to severe (6 cases). All infants survived. Traumatic injury occurred in 5 (7%) of the 74 infants, including 3 of 32 delivered vaginally. These injuries ranged from mild Erb paralysis (3 cases) to severe Erb paralysis accompanied by fracture of the clavicle or the humerus (2 cases).

**HYPOGLYCEMIA**

Heelstick glucose determination (Chemstrips) was performed in all 530 infants and true blood glucose levels were determined in 514. One or more hypoglycemic episodes were documented in 137 (27%) of the 514 infants. One third of these episodes were mild, one third were moderate, and one third were severe. Ninety percent of these infants rapidly responded to treatment, but the remaining 10% experienced 2 or more hypoglycemic episodes, lasting several hours. Demographic or clinical characteristics could not distinguish this group of infants from those who promptly responded to treatment. The incidence of neonatal hypoglycemia, by maternal diabetes classification, was 23% for class A1, 24% for class A2, and 25% for class B. Among infants of class C and D-R mothers, the incidence of hypoglycemia was 35 and 38%, respectively. These differences between classes A1, A2, B, and the more advanced classes were statistically significant (*P* < .05).

Infants born before 34 weeks’ gestation accounted for 30 of the 137 cases of hypoglycemia. Of the remaining 107 cases, 59 were LGA, 50 were AGA, and 2 were SGA. Among the 74 infants whose birth weights were 4000 g or more, 21 (30%) were also hypoglycemic. Forty-seven of 155 (30%) proportionate macrosomic infants and 8 (33%) of 25 disproportionate macroscopic infants experienced at least 1 episode of hypoglycemia during the first hour of life.

Two hundred forty-four infants (46%) of the entire group of infants were assigned to routine care and enteral feedings (see below). Of these, 32 (13%) experienced hypoglycemia. Sixteen of the 32 cases were mild and were successfully treated with early breast- or formula-feeding. Of the remaining 16 cases, 6 were moderately glycemic and 10 were severely glycemic and all 16 were treated with intravenous glucose supplementation for correction. One hundred one infants were assigned to receive intravenous dextrose administration immediately after birth and early breast- or formula-feeding. Ninety-two percent of these infants were born to mothers in A2 through D-R groups. Despite the early administration of intravenous dextrose, 22% of these infants developed 1 mild hypoglycemic episode.

**OTHER MORBIDITIES**

Hematocrits were assessed in 276 (52%) of the 530 infants. Two hundred twenty-nine (88%) had values less than 0.60. 34 (12%) had values of 0.60 to 0.64, and 13 (5%) had values of 0.65 or greater. One half of the 13 polycythemic infants were born to women with GDM. Five of these 13 infants had mild RDS, and 3 of them were treated with partial exchange transfusion. Only 3 of the 74 macrosomic infants were polycythemic. Mild hypoglycemia was noted in only 2 of 13 polycythemic infants.

One hundred twenty-five (25%) of the 530 infants were treated for hyperbilirubinemia. Phototherapy was provided for 61 (80%) of the 76 infants whose gestational age was 33 weeks or less and for 44 (35%) of those with gestation between 34 and 36 weeks. Only 20 (6%) of 329 full-term infants were treated with phototherapy. During the same 3-year period, 5% of nondia-

### Table 2. Incidence of Respiratory Distress Syndrome*  
<table>
<thead>
<tr>
<th>White Class</th>
<th>No. of Patients</th>
<th>RDS Total, No. (%)</th>
<th>Ventilator Dependent, No. (%)</th>
<th>Nonproportionate Mild RDS, No.</th>
<th>Nonproportionate Moderate RDS, No.</th>
<th>HMD, No.</th>
<th>PPHNB, No.</th>
<th>TTNB, No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>249</td>
<td>63 (25)</td>
<td>26 (41)</td>
<td>35</td>
<td>9</td>
<td>14</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>A2</td>
<td>103</td>
<td>39 (38)</td>
<td>18 (46)</td>
<td>17</td>
<td>10</td>
<td>9</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>68</td>
<td>24 (35)</td>
<td>8 (33)</td>
<td>9</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>60</td>
<td>28 (47)</td>
<td>9 (32)</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>D-R</td>
<td>50</td>
<td>28 (56)</td>
<td>14 (14)</td>
<td>13</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>530</td>
<td>182 (34)</td>
<td>65 (37)</td>
<td>84</td>
<td>41</td>
<td>34</td>
<td>10</td>
<td>13</td>
</tr>
</tbody>
</table>

* RDS indicates respiratory distress syndrome; HMD, hyaline membrane disease; PPHNB, persistent pulmonary hypertension in newborn; and TTNB, transient tachypnea in newborn.

### Table 3. Macrosomic Infants (Birth Weight ≥ 4000 g)*  
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>25</td>
<td>22 (88)</td>
<td>10 (40)</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>1 Erb with fracture</td>
</tr>
<tr>
<td>A2</td>
<td>16</td>
<td>12 (75)</td>
<td>10 (63)</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>1 Erb with fracture</td>
</tr>
<tr>
<td>B</td>
<td>13</td>
<td>10 (77)</td>
<td>8 (62)</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>2 Erb, mild</td>
</tr>
<tr>
<td>C</td>
<td>14</td>
<td>9 (64)</td>
<td>10 (71)</td>
<td>6</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>D-R</td>
<td>6</td>
<td>3 (50)</td>
<td>4 (67)</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1 Erb, mild</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>56 (76)</td>
<td>42 (57)</td>
<td>22</td>
<td>21</td>
<td>3</td>
<td>11</td>
<td>5</td>
</tr>
</tbody>
</table>

*C/S indicates cesarean section; RDS, respiratory distress syndrome; and Erb, Erb paralysis.

† Six of these 22 patients had persistent pulmonary hypertension in newborn.

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betic full-term infants received phototherapy for treatment of hyperbilirubinemia of nonhemolytic origin.

Twenty-two (4%) of the 530 infants in our study presented with transient hypocalemia. All but 2 of these patients were asymptomatic. Three of these patients were born at 33 weeks’ gestation or less and 4 patients were macrosomic. Three infants were born to mothers with class A1 and A2 diabetes, 6 to mothers with classes B and C diabetes, and 13 to mothers with class D-R diabetes. Fifty-five percent of the 530 infants were male. Comparisons among groups of infants showed that incidence and severity of neonatal morbidities were similar for both sexes.

**OUTCOME FOR INFANTS ADMITTED FOR ROUTINE CARE**

Two hundred forty-four (46%) of 530 infants were admitted to the well-baby nurseries for routine care and enteral feedings. Of these, 173 (71%) were born to mothers in A1, 30% of A2, 21% of B, and 46% of the more advanced diabetes classes. Despite our guidelines, 71 infants born to mothers with diabetes classes B through D-R were assigned to routine care; of these, one third were admitted to the NICU for treatment of RDS, hypoglycemia, or both.

Seventy-six of the 530 infants were born at or before 33 weeks of gestation. All but 2 were admitted directly from the delivery room to the NICU. The 2 infants who were assigned to routine care required subsequent NICU admission. There were 127 infants born at or between 34 and 36 weeks of gestation. Forty-three (34%) of these infants were admitted for routine care and, of this group, one half were admitted later due to hypoglycemia and/or RDS. Logistic regression analysis established that lower gestational age and advanced maternal diabetes classes were the strongest predictors for subsequent NICU care.

Ninety-three breast-fed and 90 formula-fed infants were assigned to routine care and enteral feeding. Of these, 11% and 26%, respectively, became hypoglycemic and required subsequent intravenous dextrose supplementation. Logistic regression analysis showed that, after controlling for gestational age and for class of maternal diabetes, breast-fed infants were more likely to succeed with routine care and enteral feedings.

<table>
<thead>
<tr>
<th>White Class</th>
<th>No. of Patients</th>
<th>Routine Care, No.</th>
<th>Required NICU, No. (%)</th>
<th>Hypoglycemia</th>
<th>RDS</th>
<th>Hypoglycemia-RDS</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>249</td>
<td>173</td>
<td>21 (12)</td>
<td>5</td>
<td>11</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>A2</td>
<td>103</td>
<td>44</td>
<td>13 (30)</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>68</td>
<td>14</td>
<td>3 (21)</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>60</td>
<td>10</td>
<td>4 (40)</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>D-R</td>
<td>50</td>
<td>3</td>
<td>2 (67)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>530</td>
<td>244</td>
<td>43 (18)</td>
<td>16</td>
<td>19</td>
<td>7</td>
<td>1</td>
</tr>
</tbody>
</table>

*NICU indicates neonatal intensive care unit; RDS, respiratory distress syndrome.

It has been stated that diabetic women without vascular disease (classes A through C) are at low risk for preterm delivery. More recent data suggest that a significant number of infants with gestational ages of less than 37 weeks are born to mothers with GDM and uncomplicated IDDM. In the present study, the high incidence of prematurity may be a consequence of those women referred to our center in premature labor, as well as those referred with preeclampsia for whom early delivery was indicated.

Macrosomia remains an important morbidity because it is associated with increased risk for traumatic birth injury, obesity, and diabetes in later life. Although some of the variation in incidence may be related to definition, most authors agree that excess macrosomia is in part related to maternal glucose control. The small number of macrosomic infants observed in the present study and the low frequency of morbidities may be a result of our coordinated diabetes-in-pregnancy program, which stresses good maternal diabetic control. However, because of the frequency of RDS, especially persistent pulmonary hypertension in macrosomic infants, the potential for serious morbidity still exists.

The incidence and severity of traumatic injury in our series is comparable to that reported in recent literature. Although we observed disproportionate growth among LGA infants, we were unable to detect an increase in neonatal morbidity as noted by others. Intrauterine growth restriction has been reported to occur in up to 20% of all diabetic pregnancies. Although multifactorial in origin, fetal growth failure among infants of mothers with GDM has been associated with “too tight” metabolic control. In the present study, the small number of SGA infants would not seem to support this concept. The influence of preeclampsia on fetal growth is well established, hence it was surprising that only 1 of 62 infants whose mothers had a hypertensive disorder was SGA. It is possible that relative growth stimulation from fetal hyperinsulinism may have compensated for any growth-limiting effect of preeclampsia.

With the introduction of protocols that have emphasized maternal glucose control and postponement of delivery until after fetal pulmonary maturation was docu-
mented, RDS became less common among full-term infants. In our population with 14% of the infants being born before 34 weeks of gestation, it is not surprising that a significant number of cases of hyaline membrane disease occur. It is conceivable that mild and moderate RDS as arbitrarily defined by us and transient tachypnea are expressions of the same transitional respiratory difficulties.

We have previously described our experience with the prenatal diagnosis of malformations in the offspring of pregestational diabetic women. The rate of 7% among women with White classes B through D-R² is similar to our previous report of 10% and reflects similar experience to that of other tertiary institutions.¹⁰

In spite of the progress made in antepartum management, infants of mothers with preexisting diabetes mellitus, premature infants, and LGA and SGA infants remain at greater risk for hypoglycemia. Single, mild, and short-lasting hypoglycemic episodes occur, even among infants for whom intravenous dextrose administration has been initiated. For infants assigned to routine care and enteral feedings (primarily those born to mothers with diabetes classes A1 and A2), hypoglycemic episodes occur in about 10% of the cases. It appears that one half of these episodes can be successfully treated with enteral feedings, especially in the group of breast-fed infants who are freely supplemented with formula.

Diabetic women should be offered the same opportunity to breast-feed as women without diabetes. Because the most important factor of successful breast-feeding is the lapse time to first breast-feeding, extended admission to the NICU may be a formidable obstacle. Establishing early breast-feeding is paramount, since colostrum as well as breast milk provides a generous concentration of glucose.²⁰ Keeping NICU hospitalizations to a minimum and providing breast pumps, encouragement, and assistance to mothers will maximize the chances for long-term successful breast-feeding. That 37% of all infants in our study were partially or exclusively breast-fed is a satisfactory measure of the success of our maternal glucose control and lactation programs.

Optimal care of infants of diabetic mothers is based on prevention, early recognition, and/or treatment of neonatal morbidities. Failure of routine neonatal care, which includes enteral feeding, is a concern to those treating these infants. It is little doubt that neonates with gestational ages of 33 weeks or less benefit from direct admission to the NICU. Of 127 infants born at or between 34 and 36 weeks of gestation, 46 were assigned to routine care. Among these 46 infants, there were 18 routine care failures. Thus, if all 127 infants would have been admitted to the NICU, these failures would have been prevented, albeit 28 infants would have been unnecessarily admitted.

Despite our guidelines, 71 infants of mothers with diabetes classes B through D-R were assigned to routine care and, of these, one third needed subsequent NICU care. If the guidelines regarding gestational age and severity of maternal diabetes as an indication for direct admission to the NICU had been followed, the number of routine care failures would have been decreased by almost one half. The data presented here support our guidelines that allow flexibility as to the care assignments for infants of mothers with GDM, but prevent unnecessary delays in the recognition of neonatal morbidities.

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Reprints: Leandro Cordero, MD, The Ohio State University Medical Center, Pediatrics Department, N-118 Doan Hall, 410 W 10th Ave, Columbus, OH 43210-1228 (e-mail: Cordero-1@medctr.osu.edu).

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