Assessing Obstetric Risk

A Review of Obstetric Risk-Scoring Systems

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The primary purpose of formal risk assessment in obstetrics is the prevention and consequent reduction of perinatal morbidity and mortality through early identification and intervention. Obstetric risk scoring quantifies identified risk factors according to their relative contribution to adverse perinatal outcomes and aggregates individual factor scores. A review of existing scoring methods reveals consistently low positive predictive values and more accurate prediction when the assessment occurs closer to the time of actual delivery. While numerous scoring systems exist in the literature, few are convenient in practice, and none appear to assess effectively the dynamic character of pregnancy.

Obstetric risk scoring is a formal, systematic way of identifying and quantifying antepartum and intrapartum factors that place the mother and fetus at risk for later complications. Typically, risk scoring involves allocating a number to each adverse risk factor and then combining them in some fashion to arrive at a composite score. Screening for obstetric risk is one attempt to improve pregnancy outcomes for mothers and babies. Others include effective prenatal education, improved obstetric facilities, and better access to care.

Traditionally clinicians have identified the high-risk pregnancy by reviewing the patient's medical and obstetric history, by monitoring the pregnancy, and by closely following the expectant mother once labor has begun for conditions known or presumed to result in a higher likelihood of adverse outcome. Obstetric risk assessment is a quantitative description of this clinical process. In assigning precise numbers or weights to clinical values and aggregating them into multivariate scores, the physician may presume that these scores are in some way more accurate than traditional clinical judgment based on prior experience and individual interpretation of data. In this review it will become evident that current obstetric risk scoring is neither a precise prediction of abnormal outcome nor an actuarial assessment of fetal risk[1]; rather, it is "a rough practical assessment of the potential in any given pregnancy for increased risk to the mother and fetus."[2] Risk-scoring systems complement, but do not replace, experienced clinical judgment.

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REQUIREMENTS OF AN EFFECTIVE INDEX OF HIGH RISK

The analysis of factors including perinatal mortality began with the First British Perinatal Mortality Survey, a one-week "window" of data gathered in March 1958 on 16,994 single births combined with a three-month survey of all perinatal deaths.[3] From these data, multivariate analysis yielded risk factors, and multiple regression techniques began to evaluate perinatal mortality risks so that women most likely to benefit from intensive antepartum care could be identified.[4,5] Once these factors were identified, it was then possible to assign scores or weights reflecting the individual contributions of these risk factors to adverse perinatal events. More often, such scores have represented somewhat arbitrary clinical impressions of severity rather than statistically derived probability estimates. The final

step in the development of obstetric risk-scoring systems involved the aggregation of individual risk factors scores into a composite score and the establishment of cutoff points or threshold values separating high-risk from low-risk pregnancies.

Criteria for an effective scoring system include the following: First, the method must be comprehensive, with identified factors validated by prospective studies as unequivocal risks for adverse outcomes. Weights or scores must reflect a well-validated quantitative expression of representative risk. The method should be objective and reliable, with consistent scores given for an individual patient by multiple users. Next, the method must be relatively simple and sufficiently acceptable to be used by multiple providers of prenatal care. Finally, the method should be reasonably predictive; that is, it should appropriately identify women likely to have a poor pregnancy outcome. All scoring systems must demonstrate a correlation between increasing risk score and worsening perinatal outcome. Established cutoff points for high risk must be able to discriminate effectively those with a statistically significant likelihood of poor perinatal outcome from those at low or normal risk.

Clearly these many demands are difficult, if not impossible, to fulfill by any index of high risk given the dynamic and complex nature of pregnancy. It has been mentioned that the timing of the risk assessment may also be a factor. Effective antenatal assessment has the advantage of identifying risk at a point when interventions designed to modify that risk will be more likely to be successful. Intrapartum risk may be seen as, in part, dependent on antenatal events and the care provided during this time. Conversely, intrapartum risk may in some respects be inherent in the process of labor and delivery, independent of antecedent events. As will be seen, many scoring systems assess risk at the onset of labor and during the intrapartum period, sometimes excluding antenatal assessment. The separate contributions to the risk of adverse perinatal outcome during both periods have been recognized.[6] It remains controversial as to which assessment should be emphasized as an important criterion for an effective scoring system.

Obstetric risk scoring can be viewed as a kind of screening test applied to pregnancy. Like any screening test, results must be able to be followed up with definitive diagnosis and resources for treatment. Also, as pregnancy risk is dynamic, having a likelihood that changes over time, the screening test applied at single or even at serial points during a pregnancy can never provide a precise estimate of the likelihood of an abnormal outcome. At the same time, the efficacy of a high-risk scoring system is defined by the extent to which perinatal morbidity and mortality are reduced by its application.[7]

The predictive abilities of any risk index can be evaluated using statistical terms of sensitivity, specificity, and predictive value while taking into account the prevalence of the outcomes to be predicted in the population to be screened. Sensitivity and specificity correspond to the proportion of patients classified correctly as at high or low risk for a specific adverse outcome. The positive predictive value of an obstetric scoring system describes the proportion of patients classified at high risk who actually experience a poor pregnancy outcome.[8] In ascertaining prediction, the outcome to be predicted must be clearly defined together with its prevalence in the setting where the scoring system is to be applied.

The assignment of a risk cutoff or threshold value of high risk is arbitrary and depends on the goals of the user and the societal values and resources available to provide antepartum services. By lowering the cutoff point for high risk, instrument sensitivity is increased and specificity reduced. Accordingly, more patients would receive intensive services including a higher proportion of those at low pregnancy risk. By raising the cutoff point for high risk, the opposite is true. Sensitivity is reduced and specificity is increased, resulting in fewer women receiving specialized antepartum care and a greater number of those at high risk not receiving such services.

PROBLEMS INHERENT IN ASSESSING OBSTETRIC RISK

Several theoretical and practical problems are evident in assessing obstetric risk. Despite survey data, there appears to be little consensus on what the appropriate risk factors are, much less how to weight their contribution to adverse perinatal outcome. The ideal would be to estimate degree of risk from the observed relation of risk characteristics to adverse outcomes.[9] It is not simply that there are a multitude of determinants of perinatal outcome. Frequently the factors themselves are dependent on, or interact with, one another to such an unknown degree that statistical differentiation through the use of multivariate or Bayesian methods may be little better than that obtained by good clinical judgment.[1]

The definition of high risk has itself been called into question, with estimates of the prevalence of high-risk pregnancy ranging from 16 to 55 percent.[10] The typical figure quoted is about 30 percent. These high-risk pregnancies reportedly account for approximately 50 to 60 percent of the reported perinatal morbidity and mortality. Some 40 to 50 percent of perinatal morbidity and mortality would then occur in the 70 percent of so-called low-risk pregnancies that cannot be predicted accurately by any existing scoring system.[8,11] Wilson and Schifrin[12] have logically questioned whether any pregnancy can be considered low risk. To increase the ability to predict poor outcome, a much greater proportion of pregnancies would have to be designated to be at high risk, which in turn would strain already limited resources.

Finally, measuring the efficacy of a risk-assessment method requires clearly defined outcomes. Perinatal mortality is one such outcome. Perinatal morbidity, however, may be said to include such disparate conditions as maternal complications, low Apgar scores, preterm births, low-birthweight infants, and so forth. One can rarely evaluate the predictive validity of risk-scoring systems without precisely defined endpoints.

REVIEW OF OBSTETRIC RISK-SCORING METHODS

A MEDLINE search of the literature (English language) to 1975 was conducted using a search strategy combining the following key words: prenatal care, perinatology, pregnancy complications, all screening or all mass screening, all risk or all predictive value of tests, and all outcome and process assessment. Pertinent references were added after reviewing the sources revealed through this search. Most studies evaluating risk-scoring systems infrequently provided information regarding the rationale for risk factor selection and weighing. Many did not report sensitivity, specificity, or predictive value for an adequately defined perinatal outcome. When enough information was available, these data were calculated (Appendix). While space does not permit a detailed review of each study, two scoring systems—that of Goodwin et al[2] and of Hobel et al[6,13,14]—that have been evaluated most extensively warrant brief discussion.

The antepartum fetal risk score described by Goodwin et al incorporates 31 items covering three categories to be assessed. First is the patient's status at the time of her first visit. Baseline data include her age, parity, prior obstetric history, and preexisting medical conditions. The second category of factors includes complications occurring during the present pregnancy. The third category is the gestational age of the newborn. Scores are added, and a risk cutoff of 6 was defined. The Goodwin et al system is perhaps the simplest to use and requires the least time for scoring.

In contrast is the well-published scoring system of Hobel et al.[6,13,14] Their original scoring system assessed risk at four points during the prenatal period utilizing 51 prenatal factors. The average of the four scores became the prenatal score. In addition, 40 intrapartum and 35 neonatal factors were scored during their respective time periods. Weights of 1, 5, or 10 are assigned depending on the assumed contribution of each factor in predicting perinatal morbidity or mortality. Scores are additive, and a risk cutoff of 10 distinguishes high- from low-risk pregnancies. Clearly such a system collects more information, but at the cost of being more complicated to use in practice. Edwards et al[15] found that completion of this scoring system at any point took an average of five minutes and required a five-page reference manual of instructions!

Of greatest interest are the predictive abilities of the published studies in the Appendix. All studies are able to demonstrate a correlation between increasing risk and poor outcomes. The predictive values calculated from the data provided in the original paper by Goodwin et al clearly exceed that for other studies and are difficult to explain. Most scoring systems report predictive values less than 0.3, implying that 70 percent or more of adverse perinatal outcomes appear to be unpredictable by existing assessment methods.

The Hobel et al scoring system can be evaluated in terms of its predictive accuracy in both the antepartum and intrapartum periods. Sokol et al[28] showed that low antepartum risk does not assure an uncomplicated pregnancy. Twenty percent of those at low antepartum risk were high risk during the intrapartum period, and 16 percent resulted in perinatal death. Hobel himself[14] concluded that the intrapartum period is far more predictive of perinatal morbidity and mortality than the antepartum period. While it appears that recalculation of the original data of Hobel et al does not entirely support such an assertion, it would seem reasonable that risk scoring is most unreliable at the first prenatal visit, where such an assessment is based on epidemiological factors and prior obstetric performance.

Prediction should become more accurate in late pregnancy and even more so during labor itself.[1] High-risk patients identified during the antepartum period can receive prenatal care for treatable risk factors, which, in turn, may reduce actual pregnancy risk and thereby improve outcome. Worrisome events occurring during the intrapartum period permit less time for medical interventions and usually lead to more urgent measures (forceps, cesarean section, and so on).

Molfese et al[42] evaluated five risk-screening scales containing antepartum and intrapartum components for their reliability and predictive validity. They found that all scales had good reliability (reproducibility). The antepartum scores appeared to contribute more to predicting infant outcome measures (Apgar scores, birthweight, estimated gestational age, and so forth) while the intrapartum scores best predicted the maternal outcome measure (cesarean section). The magnitude of the differences in contribution, however, was not great. Contrary to Hobel's assertion,[14] this study found that the system of Hobel et al does not demonstrate a predictive advantage for intrapartum scores over antepartum scores. Different outcome measures were used, however, thereby making a valid comparison impossible.

Even at its best, the system of Hobel et al predicted poor outcomes in only one third of the patients thought to be at high risk. Winters et al[30] provided an interesting comparison between the scoring system developed by Hobel et al and unspecified "clinical judgment" to categorize pregnancies at high risk of poor neonatal outcomes

in a predominantly black and Hispanic clinic population. They found that the positive predictive value of identifying poor neonatal outcomes in the high-risk group for the Hobel et al scoring system was 0.508, whereas that for clinical judgment was 0.461. To approach the predictive abilities reported by Hobel et al in their population, the authors had to increase the cutoff score from 10 to 40. In turn (and not recognized by the authors), this raised cutoff score decreased the false-positive rate and increased the number of false-negative results.

CONCLUSIONS

Obstetric risk scoring is an example of multivariate screening for adverse outcomes of pregnancy. For such scoring to be effective, three conditions need to be satisfied. First, the factors predisposing to risk must be identified. Second, this identification must be able to occur at an early stage. Finally, its use should lead to the reduction, reversal, or elimination of risk and thereby reduce morbidity and mortality.[43] The Canadian Task Force on the Periodic Health Examination[44] described three criteria in evaluating specific screening tests: (1) simplicity, cost, and acceptability to patient and physician; (2) benefits and risks of the test; and (3) the sensitivity, specificity, and positive predictive value of the test.

It can be seen that those factors correlated with a variety of adverse perinatal outcomes have indeed been identified. Prior historical factors can be recognized early, and developing medical obstetric conditions can, with appropriate care, be stabilized and corrected. The most consistently reported and important of these factors, however, is the lack of prenatal care.[9,45] By definition, this determinant is rarely identified prior to the onset of labor itself.

The simplicity and consequent acceptability of the risk-assessment methods reviewed have been variable. The costs have rarely been examined. There are, of course, the costs of false-positive and false-negative results of the screening test. False-positive results lead to additional diagnostic procedures and label well individuals as being at risk. False-negative results, obviously, lead the patient and the physician to a false sense of reassurance that few problems can be expected.

The ability of existing scoring systems to predict the variety of adverse outcomes has repeatedly been called into question. Rarely has the distinction been made between the early identification of preventable or treatable bad outcomes and those that may be unavoidable or untreatable. Much of the difficulty appears to be that the predictive value of any screening test depends on the prior probability or prevalence of the condition to be screened. All of the potential adverse outcomes of pregnancy are of extremely low frequency.

Under conditions of low prevalence, the predictive value of a positive screening test will be low, while the effect of specificity will be great.[46–49] Most of the scoring systems have reasonably high specificities for the outcomes studied. As was stated earlier, sensitivity, specificity, and predictive value all vary with the cutoff point discriminating high from low risk. As this cutoff point is lowered, sensitivity increases, but the specificity and positive predictive value decrease. To classify correctly most patients with poor pregnancy outcomes, the cutoff point for high risk would have to be so low as to include the majority of patients.

Risk-scoring systems are frequently used to predict perinatal outcomes and anticipate health care needs. They have determined which patients received care from which type of provider, which patients deliver in a birthing room as opposed to a delivery suite, and in some settings, which patients are candidates for a home birth. It should be obvious that a risk-scoring system that may be helpful in one area is not automatically useful for another very different kind of decision.

Several conclusions can be drawn from a comprehensive review of the literature on obstetric risk assessment. First, the multitude of risk-scoring systems alone attests to the difficulty physicians have had in selecting a desirable assessment method. While predisposing factors have been identified, many do not appear to be modifiable at the present time. The lack of prenatal care appears to be the single most important determinant of adverse perinatal outcome and should, therefore, be preventable through better educational efforts and improved access to care. Those factors that can be modified require competent medical care and close monitoring of the pregnancy itself. In turn, the delivery of such care, insofar as it has an effect on outcome, complicates the analysis of the predictive abilities of any scoring system.

Pregnancy is a dynamic period during which the level of risk appears to change—perhaps as a result of a combination of intrinsic (biologic, genetic) and extrinsic (environmental, psychosocial) events. The timing of the assessment is important; it must be predictive enough and occur sufficiently early so that actions proven to modify outcome in a positive direction can be initiated. The challenge is to develop a similarly dynamic assessment model that can be applied conveniently and effectively.

Finally, both the educational value and the predictive validity of obstetric risk scoring has been questioned—the former because of a lack of supportive studies, and the latter because of the extremely low prevalence of adverse obstetrical outcomes. That most high-risk pregnancies (eg, those complicated by unstable diabetes, hypertension, sickle cell disease, and so on) are clinically identifiable without a formal scoring system[7] prompted Lesinski to remark: "As matters stand today, a well-trained obstetrician, using good clinical judgment, can usually give a prognosis for the outcome of a current pregnancy (and even for subsequent reproductive performance) that is very close to the outcome predicted by sophisticated analysis of many variables."[10]

It is clear that much work needs to be done in this area. New, modifiable factors must be identified if obstetrical care is to have a definitive impact on adverse outcomes.

Clearly, the presence of care alone is extremely important. It remains for future investigators to determine what particular features of this care have the ability to reliably and predictively reduce perinatal morbidity and mortality.

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APPENDIX

SUMMARY OF REPORTED OBSTETRICAL RISK-SCORING SYSTEMS

Author(s)	System	Year(s) Data Collected	Sample Size	Type of Study*	Purpose	When Used	Period Assessed	Definition of High Risk	Predictive Ability (High Risk Only)**	Outcomes Studied
Rogers[16]	Risk register	1959, 1964	13,020	R	Detect handicapped children	Birth–1 mo	Antepartum Intrapartum Neonatal	1 or more factors present		
Donahue and Wan[17]	Prematurity risk score	1965, 1966	1,716	R	Predict premature births			Sum of (factor value × weighted variable) = 25th percentile		Neonatal death
Prechtl[18]	Obstetrical complications score	1967	1,378	R	Predict abnormalities	Day 2–day 14	Antepartum Intrapartum Neonatal	≤7 factors present		
Effer[19]	Prognostic risk score	1967 1968	211 350	P	Identify high-risk prenatal patients	Onset of labor	Antepartum Intrapartum Neonatal	Correction factor × sum of factors ·4.3 > 50		Perinatal mortality 1-min Apgar
Nesbitt and Aubry[20]	Semi-objective grading system (Maternal-Child Health Care Index)	1969	1,001	R	Identify patients with poor outcomes	Initial prenatal visit	Antepartum	Sum of factors ·100 < 70	**Preterm Delivery** / **Low Birthweight** Sens = .469 / .432 Spec = .713 / .728 +PV = 102 / .196	Preterm delivery, low birthweight, labor complications, cesarean section, perinatal morbidity/mortality
Goodwin et al[2]	Antepartum fetal risk score	1969	936	R	Predict fetal risk	Onset of labor	Antepartum	Sum of factors ≥ 6	**Perinatal Mortality** / **5 min Apgar < 4** Sens = .778 / .673 Spec = .971 / .979 +PV = .830 / .805	Perinatal mortality 5-min Apgar < 4
Yeh et al[21]	Antepartum fetal risk score	1971 1973	266	P	Evaluate Goodwin's high-risk scoring system	Onset of labor	Antepartum	Sum of factors ≥ 4		1 and 5 min Apgar < 7 Umbilical arterial blood pH at birth Fetal scalp blood pH Fetal heart rate patterns

Morrison and Olson[22]	Antepartum fetal risk score (Goodwin et al[2])	1977	16,733	P	Test validity of Goodwin's scoring system	Antepartum	Antepartum	Sum of factors ≥ 3	Sens = .679 Spec = .820 +PV = .070	Perinatal mortality
Foy and Backes[23]	Antepartum fetal risk	1977	96	P	Evaluate Goodwin's high-risk scoring system	Onset of labor	Antepartum	Sum of factors ≥ 4	**Perinatal Morbidity** / **Perinatal Mortality** Sens = .875 / 1.0 Spec = .925 / .80 +PV = .70 / .05	Perinatal morbidity and mortality
Coopland et al[24]	Antepartum fetal risk score (Goodwin et al[2])	1977	5,459	R	Education	Ante- and intrapartum, neonatal periods	Antepartum Intrapartum Neonatal	None	Correlation of increasing risk with worse outcome	Apgar scores, birthweight, prematurity, neonatal intensive care, perinatal mortality
Akhtar and Sehgal[25]	Prepartum and intrapartum risk-scoring method (modified from Coopland et al[24])	1978	300 924	R P	Identify high-risk patients	Ante- and intrapartum periods	Antepartum Intrapartum Neonatal	Sum of factors > 6	**Sens** / **Spec** / **+PV** .70 / na / na .255 / .899 / .259 .251 / .900 / .279 .356 / .898 / .211	Perinatal mortality, preterm birth, low birthweight Apgar < 7
Edwards et al[15]		1974–1977	2,085	P	Predict neonatal morbidity and mortality	Antepartum	Antepartum	Sum of factors ≥ 7	Sens = .886 Spec = .545 +PV = .06	Perinatal mortality
Haeri et al[26]	Perinatal mortality risk score	1969 1970	7,912	P	Find statistically valid method which has good prediction and is easy to use	First visit	Antepartum	Sum of factors ≥ 4	Sens = .329 Spec = .865 +PV = .057	Perinatal deaths
Stembera et al[27]	Identification of high-risk factors	1969 1972	3,500	P	Predict high-risk neonate and infant	Ante- and intrapartum, neonatal, infancy	Antepartum Intrapartum Neonatal Infancy	Sum of factors ≥ 40		
Hobel et al[13]	Screening to predict high-risk neonate	1969 1971	738	P	Predict high-risk neonate	Ante- and intrapartum, neonatal periods	Antepartum Intrapartum Neonatal	Sum of factors ≥ 10	**Antepartum** / **Intrapartum** Sens = .504 / .669 Spec = .685 / .701 +PV = .228 / .293	Neonatal morbidity and mortality
Sokol et al[28]	Hobel et al[13]	1976	1,275	P	Predict high-risk neonate	Ante- and intrapartum periods	Antepartum Intrapartum	Sum of factors ≥ 10	**Antepartum** / **Intrapartum** Sens = .842 / .974 Spec = .521 / .550 +PV = .051 / .062	Perinatal death and Apgar scores < 7
Baruffi et al[29]	Hobel et al[13]	1977 1978	1,600	R	Predict high-risk neonate	Ante- and intrapartum periods	Antepartum Intrapartum	Sum of factors ≥ 10, ≥20	**Antepartum Risk ≥ 10** / **Intrapartum Risk ≥ 20** Sens = .379 / .648 Spec = .724 / .552 +PV = .259 / .259	Neonatal morbidity

Continued

APPENDIX

SUMMARY OF REPORTED OBSTETRICAL RISK-SCORING SYSTEMS, CONTINUED

Author(s)	System	Year(s) Data Collected	Sample Size	Type of Study*	Purpose	When Used	Period Assessed	Definition of High Risk	Predictive Ability (High Risk Only)**	Outcomes Studied
									Antepartum Risk ≥ 10 / **Intrapartum Risk ≥ 10** Sens = .131 / .523 Spec = .927 / .695 +PV = .322 / .350	
Winters et al[30]	Hobel et al[13]		62	R	Evaluate usefulness of Hobel's risk assessment system	Postpartum	Antepartum Intrapartum	Sum of factors ≥ 10	Sens = 1.0 Spec = .091 +PV = .058	"Poor neonatal outcome" defined as sum of any of following: 1. Apgar ≤ 5 at 1 or 5 min. 2. Low birthweight < 2500 g 3. Large for gestational age 4. Estimated gestational age < 37 weeks or >42 weeks 5. Neonatal problems 6. Neonatal intensive care unit admission
Rey et al[31]	Hobel et al[13]		665	R	Evaluate Hobel's risk-assessment system	Ante- and intrapartum, neonatal periods	Antepartum Intrapartum Neonatal	Sum of factors ≥ 10	Higher scores during ante- and intrapartum were significantly associated with more neonatal complications	1- and 5-min Apgars
Fedrick[32]		1976	793	R	Antenatal identification of women at risk of preterm delivery	Antepartum	Antepartum	Multiplication of factors ≥ 5	**Primiparas**: Sens = .094, Spec = .996, +PV = .291 **Multiparas**: Sens = .253, Spec = .992, +PV = .347	Preterm birth
McCarthy et al[33]	Antepartum fetal risk score	1974 1976 1977	230,585	R	Predict neonatal death	Antepartum	Antepartum	Sum of factors ≥ 76	Sens = .006 Spec = .99 +PV = .195	Neonatal mortality
Jones et al[9]	Prenatal risk of interhospital transfer or neonatal death	1974–1977	1,021	P	Predict transfer of infants for neonatal intensive care	Antepartum	Antepartum	Sum of factors ≥ 7	**Neonatal Death** / **Transfer** Sens .706 / .688 Spec .983 / .749 +PV .041 / .183	Neonatal death; interhospital transfer for perinatal care

Adelstein and Fedrick[34]		1978	490	R	Predict low birthweight infant at term	During third trimester	Antepartum	Multiplication of scores = composite relative risk				Low birthweight
Kennedy[35]	Women Infant Care obstetrical risk score	1973 1978	1,328	R	Identify pregnant women at risk for poor neonatal outcome	Antepartum	Antepartum	Sum of factors ≥ 50	Sens = .266 Spec = .833 +PV = .129			Low birthweight
Halliday et al[36]	Prenatal risk score	1974 1978	1,268	R	Predict high-risk neonate	Postpartum Neonatal	Antepartum	Sum of factors ≥ 7	Sens = .677 Spec = .750 +PV = .064			Perinatal mortality
Pavelka et al[37]	Thalhammer's scoring system	1977–1978	162	P	Predict prematurity	First visit	Antepartum	Sum of factors > 30				Premature delivery (≤36 weeks)
Creasy et al[38]	Modified from Papiernik-Berkhauer	1978	1,092	P	Predict spontaneous preterm delivery	Antepartum	Antepartum	Sum of factors ≥ 10	**Overall** Sens = .904 Spec = .644 +PV = .304	**Primiparas** Sens = .926 Spec = .312 +PV = .208	**Multiparas** Sens = .899 Spec = .767 +PV = .327	Preterm birth
Fortney and Whitehorne[8]	Index of high-risk pregnancy			R	Test predictive validity of multiple discriminant analysis derived model	Ante- and intrapartum periods	Antepartum Intrapartum	Sum of factors ≥ 6 ≥ 7	**Sum of factors ≥ 6** Sens = .689 Spec = .776 +PV = .084	**Sum of factors ≥ 7** Sens = .561 Spec = .888 +PV = .112		Perinatal mortality Low birthweight (≤2500g)
Wilson and Sill[39]	High-risk pregnancy score		148 150	P R	Identify high-risk patients for perinatal loss	Antepartum	Antepartum	Sum of factors · 100 < 40	Sens = .164 Spec = .938 +PV = .375			Cesarean section Perinatal deaths Preterm births
Sirivongs and Parisunyakul[40]	Screening high risk pregnancy	1978 1979	503	P	Predict high-risk neonate	Ante- and intrapartum periods	Antepartum Intrapartum	Sum of factors ≥ 7	Correlation of increasing risk with worse outcome			Preterm delivery, assisted delivery, cesarean section, abnormal puerperium, Apgar < 7, birthweight
Guzick et al[7]	Multiple logistic model	1980	2,865	P	Predict preterm delivery	Antepartum	Antepartum Intrapartum	Statistically significant factors correlated with preterm delivery	Max attributable risk = .626 **Probability of Preterm Delivery** .1 .2 .4 .6	**Sens** .622 .433 .106 .043	**Spec** .794 .902 .987 .997	**+PV** .227 .301 .443 .550	Preterm delivery
Smith et al[41]	Antepartum scoring system	1981	451	R	Predict low-Apgar-scoring infants	Onset of labor	Antepartum Intrapartum	Sum of factors ≤ 10	Sens = .68 Spec = .79 +PV = .33			1-min Apgar ≤ 5

* *R = retrospective; P = prospective*
** *Sens = sensitivity; Spec = specificity; +PV = positive predictive value*

Commentary

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The assessment of risk in pregnancy has become a standard part of modern obstetric care. A variety of risk factors have been identified over the past 30 years, and risk-scoring mechanisms have been developed. The American College of Obstetricians and Gynecologists and the American Board of Family Practice have recognized high-risk factors in pregnancy.[1,2] The clinician is expected to identify these factors in a timely manner with appropriate care or referral. The preceding review by Wall puts formal obstetric risk-scoring mechanisms in perspective by showing that all are imprecise and may not be better than good clinical judgment.

Wall's analysis confirms the conventional wisdom that about one half of all poor obstetric outcomes are unpredictable (ie, occur in patients considered at low risk). He also reports that risk-scoring mechanisms are "unreliable" in that most of the time anticipated bad outcomes do not occur (low predictive value).

Wall uses predictive values too strongly to guide his logic. Just because a risk factor or risk-assessment method does not reliably predict a bad outcome does not mean that it is not important. Most would agree that driving down a busy freeway at 90 mph puts one at risk for a serious accident. Fortunately, a serious accident does not usually occur when this speed is taken. Likewise in pregnancy, it is poor statistics but fortunate for the woman and her caregivers that bad outcomes do not usually occur even in high-risk pregnancies. A composite risk score that doubles the chance of a bad outcome in pregnancy would be clinically important even though the chances of a bad outcome may be just one in ten.

Wall also implies that intrapartum risk assessment is better than antepartum risk assessment because the predictive value is higher. Again, better predictive values should not overly guide clinical logic. Prenatal assessment of certain risk factors—for example, gestational diabetes and anemia—are clinically very important, since intervention improves perinatal outcome.

A practical interpretation of Wall's analysis requires a clear separation of two issues: the identification of risk in pregnancy, and the use of formal scoring mechanisms to determine quantitatively the risk. Whether by clinical judgment or a risk-scoring mechanism, all pregnancies should be assessed for proven risk factors at the initial visit and throughout the prenatal and intrapartum periods. What constitutes high-risk as opposed to low- and medium-risk pregnancies is of critical importance to the family physician. It would be difficult to argue that most family physicians are adequately trained to manage alone high-risk pregnancies. The current medicolegal climate requires that all physicians meet current standards of care. The development of regional perinatal centers designed to care for certain high-risk pregnancies enables the family physician to be connected with such centers and to refer or share responsibility for care of these patients.

Wall indicates that there is "little consensus on what the appropriate risk factors are in pregnancy." In establishing standards of practice as part of a risk-management program for family physicians delivering babies in California, I had little difficulty finding consensus on what constitutes a high-risk pregnancy.[3] Committees of the American College of Obstetrics and Gynecologists have developed consensus statements on what constitutes a high-risk pregnancy, which have been published by the American Board of Family Practice.[1,2] Hence, there are certain risk factors, such as age over 40 years or multiple pregnancy, in which there is agreement of risk status. There are a variety of other risk factors, however, often called medium risk, such as gestational diabetes and anemia, that are open to interpretation as to what number or degree constitutes a high-risk pregnancy.

What is important for the physician in practice is not which mechanism is used to quantify the risk status of a patient but whether the physician is equipped to recognize and manage risk when it is present. Wall's analysis is of service to the busy clinician because it properly criticizes complex and impractical risk-scoring systems. There remains the need for the physician to have a record system that allows for the identification of risk in pregnancy. An obstetric record should have the accepted risk factors listed to facilitate clinical judgment.

What percentage of pregnancies are at high risk? Wall states that most scoring mechanisms give a rate of high-risk status of about 30 percent. The family physician delivering babies in a time of high liability insurance rates will want both to preserve a healthy market of activity and to refer properly true high-risk pregnancies. Hence, the specialty of family practice has a vested interest in

taking a leadership role in the determination of risk in pregnancy and the development of practice standards.

Rosenblatt has called for a "new direction" for family practice in maternity care.[4] He challenges family physicians to move away from a "mini-obstetrician" model of care that looks at pregnancy as a medical condition mandating a maximal strategy to avoid all possible bad outcomes.[5] Rather, low-risk pregnancies should be managed from a naturalist perspective with no specific medical intervention. There is evidence that family physicians using this approach may have better outcomes than obstetricians.[6]

Applying this philosophy still requires risk assessment, for which there are two extremes. One would be a maximal strategy approach that compulsively includes all possible risk factors and is likely to result in most pregnancies being considered at risk. Another would be the approach of Michel Odent in France, who espouses an "antiobstetrics" philosophy in which all pregnancies and labors are normal until demonstrated otherwise.[7] Somewhere between lies the proper balance for maternity care, and family physicians must be active in the dialogue to preserve the role of the family physician in this critically important area of family practice.

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