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Review Article

Intrapartum Fetal Surveillance: Summary of Four National Evidence-Based Guidelines and Need to Develop Indian Guidelines

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Abstract

Introduction: There are more deliveries in India than any country in the world, according to World Health Report. Review of seven articles published in The Journal of Obstetrics and Gynecology of India suggests that the perinatal mortality (PNM) in the country is 92/1,000 (16,339/177,998) births and the cause is asphyxia in about one fourth of the cases. *Methods:* We reviewed the evidence-based guidelines on intrapartum fetal surveillance from four countries (UK, USA, Canada, and Australia/New Zealand). *Results:* Overall there were 72 recommendations and whether they were level A, B, C, or D varied significantly (p=0.021) for the four national guidelines. The composite summary of these recommendations indicates that no single guideline is comprehensive, the composite may be better than any singular. *Conclusion:* Each country needs its own recommendations to ameliorate the PNM. Accounting for the varied setting childbirths occurring in the country, a national guideline for clinicians in India may decrease the PNM secondary to asphyxia.

Keywords: intrapartum, fetal, surveillance, national, guidelines.

Introduction

According to the World Health Report 2005, there are more live births (25 million/year) in India than in any other country, including China (19 million/year). Comparing China to India, the stillbirth rate (19 vs. 39/1,000 births, respectively), death of newborn ≤1 week (16 vs. 33/1,000 births), and ≤4 weeks (21 vs. 43/1,000 births) of birth rates are twice as high in India[1]. Incontestably, there are numerous, complex, and unavoidable reasons for the higher mortality in India, but we sought a two-step explanation that might ameliorate the perinatal outcome.

First, we reviewed every obstetric publication in The Journal of Obstetrics and Gynecology of India that appeared between 2000 and 2006 and available at their web site. Such a review provided us with the potential causes for the perinatal mortality (PNM) in India. Since

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there are no national guidelines in India regarding intrapartum surveillance of fetus, we appraised the national guidelines[2,3,4,5] from four countries to provide a simplified starting point for possible endeavors.

Review of The Journal of Obstetrics and Gynecology of India

From the official website (http://www.journal-obgyn-india.com/index.htm), we were able to print 321 obstetric articles that were published over 7 years. Review of these publications was notable for seven publications[6,7,8,9,10,11,12] that focused on the rate as well as the causes of the PNM (Table 1). The cohorts of the seven articles gave birth to their children between 1991 and 2002. The authors reviewed their institution's data for the preceding 1 to 10 years. These publications described their experience from 2,000 to 70, 000 deliveries. The stillbirth rate varied from 22 to 74/1,000 deliveries, with an overall rate of 59/1,000 (10,531/177,998); the corresponding numbers for the PNM were from 56 to 107/1,000, with an overall rate of 92/1,000 (16,339/177,998). It does not seem that adverse outcome decreased with later publications, suggestive that these outcomes did not improve recently. Asphyxia as the cause of the PNM varied from 3 to 44%, with an overall rate of 28%.

Admittedly, these seven publications merely suggest the rate and causes of the PNM in India and that a national survey or a multicenter study would provide a more accurate assessment of the likelihood and the etiology of these deaths. Meanwhile, it could be beneficial to determine how clinicians could decrease asphyxia as the potential etiology of PNM in India.

Methods and Results

Evidence-Based Guidelines

American College of Obstetrician and Gynecologists (ACOG) practice bulletins are one of the most influential publications for clinicians involved with childbirth in the USA[13]. These evidence-based guidelines are the results of reviews of all publications in English language on the topic, objective evaluation of each reference, and a condensed synthesis of recommendations from the literature. These suggestions are categorized as levels A, B, C, D, and E (Table 2). The stated purpose of these guidelines is to optimize the outcomes, decrease the costs of healthcare, and diminish the potential liability[13].

Interestingly, there are guidelines on intrapartum fetal evaluation from Australia, Canada, and UK. Although they were published in different years and did not use identical references, these guidelines are similar in that they are evidence-based synthesis from English language articles, with the stated purpose of improving outcomes. Thus, it seems reasonable to review these four national guidelines to determine the similarities and differences and to allow national societies of other countries adopt these recommendations to the unique situations of childbirth in their country.

Four National Guidelines on Intrapartum Fetal Surveillance

While ACOG had six recommendations on the topic, Australian New Zealand College of Obstetricians and Gynecologists (Royal ANZCOG) had 13, Royal College of Obstetricians and Gynecologists (RCOG) 16, and Society of Obstetricians and Gynecologists of Canada (SOGC) 37. Chi square test for trend indicates that among the 72 recommendations from these organizations, the types of recommendations varied significantly ($p=0.021$; Fig. 1). Since simple tabulation of the recommendations is not very useful clinically, we synthesized them by segregating them into 13 categories—competency, equip-ment, prenatal course, admission for labor, continuous vs. intermittent auscultation, nonreassuring fetal heart rate (FHR), fetal blood sampling, expedited delivery, operative delivery, umbilical arterial/venous pH, adverse outcomes, audit and risk management, and future technology.

Competency

Of the 72 recommendations, 8 (11%) focused on the competency of providers and all of them were level C. One of these eight suggestions was from RANZCOG and the rest from RCOG. They indicate that it is the institute's responsibility that healthcare providers have an understanding not only of maternalfetal pathophysiology, but also have competence in the various intrapartum surveillance methods (RANZCOG). RCOG suggestions include an awareness of chain of command when an abnormal FHR is noted, common terminology to be used, and annual training for healthcare providers. This training should be provided by the trusts, not the providers, and should focus on intermittent auscultation (IA), electronic fetal monitoring (EFM), and how to document and store the

Table 1
Perinatal mortality in India.

	Published in	City	No. of Births	Stillbirth/1,000	PNM/1,000	Asphyxia and PNM
Agarwal RK et al[6]	2000	Jaipur	70,629	54	93	42%
Kamat AA & Jindal MV[7]	2001	Goa	17,938	22	105	26%
Gaddi SS & Seetharam S[8]	2001	Bellary	2,718	71	106	23%
Rao S et al[9]	2001	Mumbai	6,778	37	56	13%
Shinde MA[10]	2001	Ambajogai	5,191	76	84	3%
Saha S & Saha A[11]	2002	Darjeeling	25,351	73	107	44%
Lucy D et al[12]	2005	Cuttack	49,393	74	105	26%
Total			177,998	59	92	28%

PNM, perinatal mortality

Table 2
Classification of the recommendations in four national guidelines.

	Level A	Level B	Level C	Level D
ACOG	Based on good and consistent scientific evidence.	Based on limited or inconsistent scientific evidence.	Based primarily on consensus and expert opinion.	
ANZCOG	Requires adequate randomised trial.	Requires availability of well-conducted clinical studies.	Evidence obtained from expert committee reports or opinions.	
ROGC	Requires at least one randomised controlled trial.	Requires availability of well-conducted clinical studies.	Evidence obtained from expert committee reports.	
SOGC	Good evidence to support the recommendation.	Fair evidence to support the recommendation.	Poor evidence regarding the inclusion or exclusion of the condition in a periodic examination.	Fair evidence to support the recommendation that the condition not be considered in a periodic examination.

ACOG, American College of Obstetricians and Gynecologists; RAZCOG, Royal Australian New Zealand College of Obstetricians and Gynaecologists; RCOG, Royal College of Obstetrician and Gynaecologists; SOGC, Society of Obstetrics and Gynaecologists of Canada.

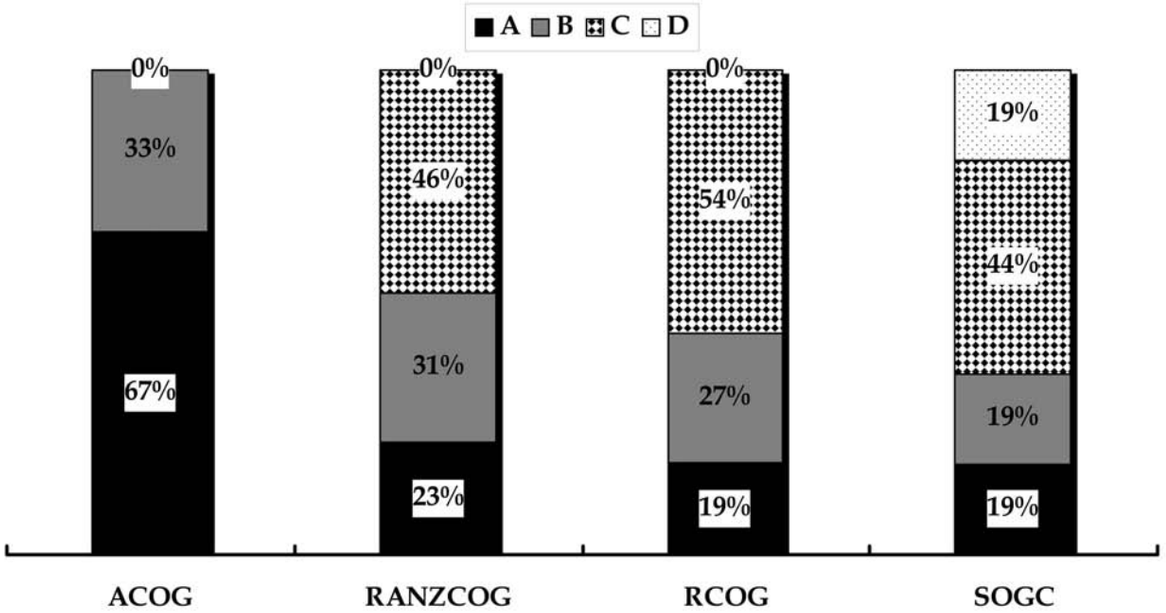

Fig. 1: Recommendations by four national guidelines on intrapartum fetal surveillance. (ACOG, n=6; ANZCOG, n=13; ROGC, n=16; SOGC, n=37; p=0.021)

information. It is noteworthy that neither ACOG nor SOGC made any recommendations on this topic.

Equipment

Regarding equipment, both RANZCOG and SOGC had one level C recommendation and they focused on the paper speed during EFM. The national society in Australia and New Zealand specified the speed to be 1cm/min in both countries because many health professionals move between the two countries. They acknowledge that one paper speed is not superior to another. SOGC, on the other hand, suggests that all clinicians be aware of the paper speed, so as to avoid misinterpretation. The Canadian society does not suggest a uniform paper speed. RCOG and ACOG do not have any recommendations regarding EFM equipment.

Prenatal Course

There were two level C recommendations, one each from RANZCOG and RCOG, which suggest that prior to presenting in labor, patients should be informed about the two techniques to monitor fetuses during labor. While RANZCOG specifies that during the prenatal course patients should have information about IA and EFM, RCOG encourages clinicians to provide women with evidence-based information so they can make informed decisions.

Upon Admission

Once the parturient is admitted, there were five recommendations that are applicable. SOGC specifies that in active labor, women receive continuous, close one-to-one support and this is categorized as a level A recommendation. RCOG suggests that prior to starting any type of monitoring, maternal and fetal pulse should be palpated simultaneously so the two can be differentiated (level C). RANZCOG, SOGC, and RCOG indicate that there is insufficient evidence about the usefulness of fetal admission testing with cardiotocography (CTG) in low-risk women. RANZCOG acknowledges that admission tests may have potential minor benefit but are linked to an increase in minor intervention (level B). RCOG simply does not support the role of admission tests and considers this to be a level B recommendation. Lastly, SOGC considers that there is insufficient information about admission tests and further research needs to be done on the topic (level C).

IA versus EFM

Of the 72 recommendations in the four guidelines, 29% (21) focused on the two methods of monitoring the fetus during labor. To begin with, RCOG notes that regardless of the technique selected to assess fetal well-being, the same level of care should be provided (level C). RANZCOG specifies that at least one of these techniques should be used for fetal surveillance with all admissions (level C).

For low-risk or healthy parturients, IA is recommended by RCOG, RANZCOG, and SOGC. It is notable that this is one of the few times three different national organizations made similar recommendations and categorized it as level A. Though the three guidelines do not define what a low-risk patient is, they do provide the indications for EFM. Thus, we can infer what patient can be monitored with IA.

The recommendations describe the nuances of IA. To begin with, IA should be done with audible Doppler and not a Pinard stethoscope (level A by RANZCOG). The auscultation episode should commence toward the end of a contraction and continue for ≤30 seconds after the contraction has finished. FHR should be auscultated at least every 15-30 minutes in the active phase of the first stage of labor, at least every 5 minutes in the second stage of labor, and toward the end for ≤30 seconds after each contraction during active pushing in the second stage of labor. Interestingly, while RANCOG and RCOG agree on how frequently IA should be done, they classify it as level C and A, respectively.

If intrapartum complications occur in a low-risk patient, it should be documented contemporaneously in the maternal notes, signed, the time noted (level C, RCOG), and to ensure fetal well-being, EFM utilized (level B, RANZCOG). IA should also be abandoned if the baseline is <100 bpm or >160 bpm or if there is evidence on auscultation of any decelerations (level A, RCOG). All four national guidelines recommend that for high-risk parturients, EFM should be used (level B for ACOG, RANZCOG, RCOG, and level C for SOGC). Antepartum and intrapartum risk factors that require EFM are listed in Table 3 and are composite of suggestions by RANZCOG, RCOG, and SOGC. ACOG does not specify the indications for EFM. Pregnancies at risk for neonatal death, cerebral palsy, or neonatal encephalopathy should be monitored by EFM (level C, SOGC).

These guidelines also suggest that the timing of EFM patterns should be determined in association with uterine contractions. The contraction frequency, duration, intensity, and resting tone should be assessed and documented. Abdominal palpation, a tocodynamometer, or an intrauterine pressure catheter may be used to facilitate the assessment (level C, SOGC). To optimize outcomes, practitioners should use standard terminology when describing fetal heart characteristics of an EFM record (level C, SOGC). The frequency of reviewing the EFM records is every 15 minutes in the active phase of labor and at least every 5 minutes in the second stage of labor (level C SOGC).

Lastly, it should be noted that RCOG provides detailed level suggestions about utilizing EFM and what they should include. The inclusions are as follows: conduct of EFM; date and time clocks on the EFM machine; tracing labeled with the mother's name, date, and hospital number; intrapartum events that may affect the FHR noted contemporaneously on the EFM tracing, signed, dated, and timed (e.g., vaginal examination, fetal blood sample, sitting for an epidural); any member of the staff asked to provide an opinion on a tracing noting their findings on both the tracing and maternal case notes, together with date, time, and signature; following the birth, caregiver note signed with the date, time, and mode of birth on the EFM tracing; and the EFM tracing should be stored securely with the maternal notes at the end of the monitoring process.

Nonreassuring FHR

There are seven recommendations on the management of nonreassuring FHR and most (71%; 5/7) are level A. If FHR is considered to be abnormal with IA, EFM, scalp pH or delivery should be considered (level A, SOGC). When the FHR pattern is considered abnormal, immediate management includes identification of reversible causes of the abnormality, initiation of appropriate action—correction of maternal hypotension, cessation of oxytocin and/or tocolytics, and initiation or maintenance of continuous EFM. If FHR abnormalities persist, consider delivery. These are level A recommendation by RANZCOG.

For recurrent variable decelerations, amnioinfusion should be considered because it decreases the rate of emergency cesarean delivery (level A, ACOG). In the presence of abnormal FHR patterns and uterine hypercontractility (not secondary to oxytocin

Table 3
High-risk pregnancies requiring electronic fetal monitoring

Antepartum	Intrapartum
Abnormal antenatal cardiotocography	Abnormal auscultation or cardiotocography
Abnormal umbilical arterial Doppler velocimetry	Absent liquor following amniotomy
Anomalies	Abnormal vaginal bleeding in labor
Antepartum hemorrhage	Active first stage of labour >12 hours
Diabetes—on medication, poorly controlled, suspected macrosomia	Active second stage >1 hour and delivery is not imminent
Hypertension	Epidural analgesia
Isoimmunization	Hypertonic uterus
Malpresentation	Maternal fever >380 C/intrauterine infection
Multiple pregnancy	Meconium or blood tinged liquor
Oligohydramnios	Oxytocin use—augmentation or induced
Preeclampsia / eclampsia	Preterm labour—gestational age <37 weeks
Prior uterine scare/cesarean delivery	
Prolonged pregnancy (gestational age >42 weeks)	
Prolonged rupture of membranes (>24 hrs)	
Suspected intrauterine growth restriction	
Other medical or obstetric risk factors that increase the risk of fetal compromise	

Adapted from Royal Australian New Zealand College of Obstetricians and Gynaecologists; Royal College of Obstetricians and Gynaecologists, and; Society of Obstetrics and Gynaecologists of Canada.

infusion) tocolytics should be considered. A suggested regimen is subcutaneous terbutaline 0.25 mg (level A, RCOG).

The two level B recommendations from RCOG are: during the episodes of abnormal FHR patterns, when the mother is lying supine, she should adopt the left-lateral position, and in cases of hypercontractility in association with oxytocin infusion and with suspicious or pathological CTG, the oxytocin infusion should be decreased or discontinued.

Expedited Delivery

There are two recommendations regarding the conditions that should prompt expedited delivery—one from RANCOG, which is level B, and from RCOG, which is level A. The recommendation from Australia and New Zealand states that delivery should be expedited if significant acidosis is suspected or there is clear evidence of serous fetal compromise, or CTG abnormalities are of a degree requiring further assessment, but FBS is contraindicated, clinically inappropriate, or not feasible. The recommendation in the UK is that in cases of suspected or confirmed acute fetal compromise, delivery should be accomplished as soon as possible, accounting for the severity of FHR abnormality and relevant maternal factors. The accepted standard has been that, ideally, this should be accomplished ≤30 minutes. Neither SOGC nor ACOG make any recommendations on this topic.

Operative delivery

There is only recommendation on this topic and it does not focus on the indication or the manner on how to

conduct it. The level A recommendation by ACOG is that use of EFM is linked with operative delivery, which includes not only vaginal but also cesarean.

Umbilical acid-base analysis

The two recommendations on this topic are from RCOG, who suggest that acid-base status should be analyzed from the umbilical artery as well as vein (level B). Although the samples can be analyzed in other situations, they should be obtained when emergency cesarean section is performed, instrumental vaginal delivery is performed, a fetal blood sample has been performed in labor, or if the condition at birth is poor (level C).

Adverse outcomes—Cerebral palsy and neonatal death

Since the purpose of the intrapartum surveillance is to avoid these two adverse outcomes, it is interesting to note that there are five recommendations, two (40%) of which are level A. The false rate of EFM for predicting adverse outcomes is high, and the use of EFM does not result in a reduction of cerebral palsy rates. Both of these recommendations are level A and from ACOG. The reinterpretation of FHR tracing, when aware of the neonatal outcome, is not reliable (level B, ACOG).

As alluded to previously, continuous intrapartum EFM is recommended for pregnancies when there is increased risk of perinatal death, cerebral palsy, or neonatal encephalopathy (level C, SOGC and level B, RCOG). Lastly, if fetal death is suspected despite the presence of an apparently recordable FHR, then fetal viability should be confirmed with real-time ultrasound assessment (level C, RCOG).

Audit and risk management

Neither ACOG nor SOGC provide recommendations but the other two national societies do. All health professionals should participate in regular multidisciplinary clinical audits focusing on maternal and perinatal outcomes in relation to intrapartum fetal surveillance (level C, RANZCOG). RCOG describes the absolute outcome measures of fetal/neonatal hypoxia to be collected at a local and regional level: perinatal deaths, cerebral palsy, and neurodevelopmental disability (level B, RCOG). The intermediate fetal/neonatal measures of fetal hypoxia to be collected should be umbilical artery acid-base status, Apgar score at 5 minutes, and neonatal encephalopathy (level B, RCOG). The maternal outcome measures that should be collected include the rates of operative vaginal and cesarean deliveries (level C, RCOG). Additionally, RCOG recommends that a tracer system should be developed to ensure that CTG removed for any purpose (e.g., risk management, teaching purpose) can always be located (level C). Lastly, EFM traces should be kept for ≥25 years (level C, RCOG).

Future technology

Only SOGC made any recommendations about the role of newer technology in intrapartum surveillance. According to them the use of computer-based algorithms alone to interpret FHR patterns is not recommended as a standard of care at the present time (level D). The fetal pulse oximetry as an adjunct to EFM in patients with nonreassuring FHR status is also not recommended as a standard of care at the present time. Moreover, near-infrared spectroscopy as an adjunct to EFM is currently not recommended as there is insufficient evidence to assess its efficacy in fetal surveillance. Although all three of these are level D recommendations, SOGC considers not using ST waveform analysis technology as a standard of care at this time as a level C recommendation.

Further study on pulse oximetry, ST waveform analysis, and near-infrared technology in clinical research settings is encouraged by SOGC and this is a level B recommendation.

Conclusions

Review of the publications in The Journal of Obstetrics and Gynecology in India suggests that up to one fourth of PNM in the country is linked with asphyxia. It would be beneficial to know the medical or obstetrical factors that lead to asphyxia, whether it was due to delayed care or inappropriate use of resources, and if it was preventable or not. While awaiting an in-depth analysis of PNM, it would be prudent to review the national guidelines on intrapartum surveillance. The recent third National Family Health Survey suggests that the PNM is 49/1,000 pregnancies. While this improvement is a remarkable achievement, it needs to be verified in peer-reviewed publications and it does not mitigate against learning from other national guidelines to lower the mortality even further.

A summary of four national recommendations on fetal assessment during labor provides a source for Indian obstetricians-gynecologists to consider formulating unique

guidelines for their country that addresses the nuances of childbirth, and attempts to ameliorate the high PNM.

It may not be feasible, at present, to formulate such guidelines for the country that does more deliveries than any other. If not guidelines, perhaps further studies, like the one done in Pakistan[14] or at Tata Main Hospital[15], can be undertaken to decrease the PNM.

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