
CLINICAL AND COMMUNITY STUDIES
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ÉTUDES CLINIQUES ET COMMUNAUTAIRES

Electronic fetal monitoring: a Canadian survey

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Objectives: To determine the current status of electronic fetal monitoring (EFM) in Canadian teaching and nonteaching hospitals, to review the medical and nursing standards of practice for EFM and to determine the availability of EFM educational programs.

Design: National survey in 1989.

Participants: The directors of nursing at the 737 hospitals providing obstetric care were sent a questionnaire and asked to have it completed by the most appropriate staff member. The response rate was 80.5% (593/737); 44 hospitals did not have deliveries in 1988 and were excluded. The remaining hospitals varied in size from 8 to 1800 (mean 162.1) beds and had 1 to 7500 (mean 617.1) births in 1988; 18.8% were teaching hospitals.

Results: Of the 549 hospitals 419 (76.3%) reported having at least 1 monitor (range 1 to 30; mean 2.6); the mean number of monitors per hospital was higher in the teaching hospitals than in the nonteaching hospitals (6.2 v. 1.7). Manitoba had the lowest mean number of monitors per hospital (1.1) and Ontario the highest (3.7). In 71.8% of the hospitals with monitors almost all of the obstetric patients were monitored at some point during labour. However, 21.6% of the hospitals with monitors had no policy on EFM practice. The availability of EFM educational programs for physicians and nurses varied according to hospital size, type and region.

Conclusions: Most Canadian hospitals providing obstetric services have electronic fetal monitors and use them frequently. Although substantial research has questioned the benefits of EFM, further definitive research is required. In the meantime, a national committee should be established to develop multidisciplinary guidelines for intrapartum fetal assessment.

Objectifs : Déterminer l'état actuel de la surveillance électronique du fœtus (SEF) dans les hôpitaux canadiens d'enseignement et autres, examiner les normes de pratique médicales et infirmières par rapport à la SEF et déterminer la disponibilité des programmes de formation en SEF.

Conception : Sondage à l'échelle nationale mené en 1989.

Participants : Les directeurs des soins infirmiers de 737 hôpitaux prodiguant des soins obstétriques ont reçu un questionnaire qu'on leur a demandé de faire remplir par le membre le plus approprié du personnel. Le taux de réponse était de 80,5 % (593/737); en 1988, aucun accouchement n'a été pratiqué dans 44 hôpitaux que l'on a exclus. L'importance des autres hôpitaux variait de 8 à 1,800 (moyenne de 162,1) lits, et on y avait pratiqué de 1 à 7 500 (moyenne de 617,1) accouchements en 1988; 18,8 % étaient des hôpitaux d'enseignement.

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Résultats : Sur les 549 hôpitaux, 419 (76,3 %) ont dit posséder au moins un moniteur (écart de 1 à 30; moyenne de 2,6); le nombre moyen de moniteurs par hôpital était plus élevé dans les hôpitaux d'enseignement que dans les autres hôpitaux (6,2 c. 1,7). Le Manitoba avait le nombre moyen le moins élevé de moniteurs par hôpital (1,1), et l'Ontario avait le nombre le plus élevé (3,7). Dans 71,8 % des hôpitaux dotés de moniteurs, presque toutes les patientes admises en obstétrique ont fait l'objet d'une surveillance à un point quelconque du travail. Cependant, 21,6 % des hôpitaux pourvus de moniteurs n'avaient aucune politique sur la pratique de la SEF. L'offre des programmes de formation en SEF à l'intention des médecins et des infirmières variait selon l'importance, le type et la région de l'hôpital.

Conclusions : La plupart des hôpitaux canadiens qui fournissent des services d'obstétrique sont équipés de moniteurs de surveillance électronique du fœtus, et ils les utilisent fréquemment. Bien que des recherches approfondies aient mis en doute les avantages de la SEF, d'autres recherches concluantes s'imposent. Entre-temps, il faudrait créer un comité national afin d'élaborer des lignes directrices multidisciplinaires pour l'examen intrapartum du fœtus.

The use of electronic fetal monitoring (EFM) during labour has increased dramatically in Canada and other countries over the past 30 years.¹ EFM became widely used before either the results from scientific clinical efficacy trials or standardized educational programs for health care professionals were available.

The main advantage of EFM has been the provision of objective information on fetal heart rate patterns and uterine activity to allow for rapid intervention. In the past 15 years several large randomized controlled trials in different countries have compared the use of EFM and intermittent auscultation.²⁻¹⁰ Comprehensive reviews of these studies revealed that the clinical significance of EFM is not clearly evident.^{1,11,12} One of the main limitations of analysing the results of these clinical trials is that the caregivers might have had variable expertise in interpreting the tracings and making clinical management decisions. Indeed, in one study, by Shy and associates,¹⁰ "clinicians deviated from procedures for managing EFM patterns suggested by the study protocol."

From a survey of obstetricians in the United States, Helfand, Marton and Ueland¹³ reported that there was wide variation in how obstetricians used, interpreted and acted on EFM tracings. Other studies of expert clinicians have also demonstrated wide intraobserver and interobserver variation in interpreting and acting on tracings;^{1,14,15} the investigators concluded that the variability must be reduced before the "true" predictive value and cost-benefit ratio of EFM can be estimated. Furthermore, terms such as fetal distress and asphyxia are poorly understood, and there is variation in diagnosis.^{16,17}

The Society of Obstetricians and Gynaecologists of Canada issued a statement related to EFM practices in 1981.¹⁸ That statement did not address educational requirements or criteria for using EFM in medical practice, but it did identify several areas for future research. The scientific evidence of the

effectiveness of EFM has been reviewed by the Canadian Task Force on the Periodic Health Examination.¹⁹ The recommendations depend on risk level. For high-risk pregnancies there was poor evidence for either inclusion in or exclusion from the periodic health examination. For low-risk pregnancies there was fair evidence to exclude EFM from routine intrapartum care. From a medical-legal perspective clinical decisions about whether to use EFM or intermittent auscultation must be made every time a woman goes into labour. For Canadian obstetricians, family physicians, midwives and nurses what does "fair evidence" actually mean, and what clinical protocols should be followed?

A review of the literature revealed no national Canadian data about EFM standards for practice or content to include in educational programs for health care professionals. Therefore, we undertook a national survey to determine (a) the current status of EFM in Canadian teaching and nonteaching hospitals, (b) the medical and nursing written standards of practice and policies and (c) the availability of educational programs on EFM.

Methods

A questionnaire was developed and examined for content validity by a panel comprising medical and nursing experts. It was pretested by medical and nursing administration personnel from teaching and nonteaching hospitals. The questionnaire was translated into French and reviewed for comparability with the English version. In the fall of 1989 the revised questionnaire was mailed to the directors of nursing at the 737 hospitals in Canada providing obstetric care.²⁰ The directors were asked to have the questionnaire completed by the most appropriate, knowledgeable staff member in their institution. Following the survey protocol described by Dillman,²¹ we sent follow-up postcards and additional questionnaires after the initial mailing.

Results

Of the 737 hospitals 593 (80.5%) returned the questionnaire: 549 (92.6%) of the responding hospitals reported births during 1988; the remainder were excluded from all analyses. Of the 549 hospitals 419 (76.3%) reported having electronic fetal monitors. Overall there were few missing data.

Current status of EFM

Table 1 presents the survey response rate and the mean number of monitors per hospital by province and territory. The hospitals ranged in size from 8 to 1800 (mean 162.1) beds. The number of births were from 1 to 7500 (mean 617.1) during 1988: 37.2% (192/516) had up to 99 births, 31.6% (163/516) had 100 to 499 births, and 31.2% (161/516) had 500 or more births. The proportion of

teaching hospitals was 18.8% (99/527). Although most of the hospitals reported having up to 30 (mean 2.6) monitors, the teaching hospitals had a higher mean number than the nonteaching hospitals (6.2 v. 1.7 monitors) (Table 2).

Each respondent was asked to report the hospital's level of care, as defined by the Department of National Health and Welfare²² (descriptions of the definitions were provided). Level 1 services (for women and newborns with "no identifiable risk") were provided by 71.7% (383/534) of the hospitals, level 2 services ("additional resources for selected high-risk problems") by 23.0% (123/534) and level 3 care ("additional resources for ultra high-risk problems") by 5.2% (28/534). In addition, 19.7% (108/549) reported being regional perinatal care centres. Such centres are level 2 or 3 institutions to which women are referred from level 1 institutions. The level 3 hospitals reported a mean of 9.6 mon-

Table 1: Response rate and status of electronic fetal monitoring (EFM) among hospitals in Canada providing obstetric services

Province/ territory	No. (and %) of hospitals				Mean no. of hospitals with monitor(s)
	Sent questionnaire	Returned questionnaire	With births in 1988	With monitor(s)	
British Columbia	82	62 (75.6)	60	49 (81.7)	2.3
Alberta	109	83 (76.1)	80	61 (76.2)	2.0
Saskatchewan	119	91 (76.5)	72	32 (44.4)	1.2
Manitoba	68	54 (79.4)	49	23 (46.9)	1.1
Ontario	166	152 (91.6)	143	123 (86.0)	3.7
Quebec	94	75 (79.8)	71	70 (98.6)	3.4
New Brunswick	22	19 (86.4)	19	18 (94.7)	2.7
Nova Scotia	35	28 (80.0)	27	18 (66.7)	2.1
Prince Edward Island	5	4 (80.0)	4	4 (100.0)	2.5
Newfoundland	28	20 (71.4)	18	15 (83.3)	2.1
Northwest Territories	6	4 (66.7)	4	4 (100.0)	2.5
Yukon Territory	3	1 (33.3)	2	2 (100.0)	2.8
Total	737	593 (80.5)	549	419 (76.3)	2.5

Table 2: Distribution of electronic fetal monitors in hospitals that had births in 1988, by type of hospital and level of perinatal care

Variable	No. of monitors	
	Mean (and standard deviation)	Range
Type of hospital		
Teaching (n = 99)	6.2 (5.3)	0-30
Nonteaching (n = 428)	1.7 (2.1)	0-11
Total (n = 527)*	2.6 (3.4)	0-30
Level of care ²²		
1 (n = 383)	1.3 (1.8)	0-15
2 (n = 123)	4.9 (3.5)	0-17
3 (n = 28)	9.6 (6.2)	2-30
Total (n = 534)†	2.6 (3.5)	0-30

*Data were missing for 22 (4.0%) of the hospitals.

†Data were missing for 15 (2.7%) of the hospitals.

itors per hospital, as compared with 1.3 monitors per level 1 hospital (Table 2).

A central display station for monitors was reported by only 5.3% (22/419) of the hospitals. Those with this capability reported that the tracings of 1 to 13 (mean 4.4) monitors could be displayed simultaneously. Although only 1.8% (7/398) of the respondents stated that tracings were being transmitted electronically to other centres, another 50.8% (202/398) expressed an interest in being able to transmit tracings to regional perinatal centres.

Medical and nursing standards of practice

In practice most of the hospitals with electronic fetal monitors (71.8% [293/408]) reportedly monitored "almost all" their obstetric patients at some point during labour (Table 3). The monitoring policies of the hospitals are reported in Table 4. Written medical and nursing policies, protocols or procedures were used by 30.1% (123/408); 46.8% (191/408) had only nursing policies, 1.5% (6/408) had only medical policies, and 21.6% (88/408) had neither type.

Copies of the monitoring policies were provided by 232 (55.4%) of the 419 hospitals with monitors. The length and format of the policies of both teaching and nonteaching hospitals varied widely. An analysis of the content of the policies revealed the following distribution of categories: description of EFM procedure (in 80 [34.5%]); how to interpret EFM patterns and what interventions should occur (in 65 [28.0%]); indications for EFM (in 70 [30.2%]); charting, documentation and storage requirements (in 60 [25.9%]); and educational preparation requirements for nurses (in 62 [26.7%]).

A physician's order was explicitly required to initiate EFM in seven (3.0%) of the hospitals according to the policy documents. Steps for problem-solving when a nonreassuring pattern was identified were provided in only 8 (3.4%) of the documents, and even fewer (3 [1.3%]) included written mention of information or actions related to the psychological or professional support of women in labour.

Availability of EFM educational programs

Over one-third of the respondents (36.7% [155/422]) reported that a structured EFM course was provided during nurses' orientation to the labour-delivery unit. These courses usually contained both theoretic and practical components and usually lasted 1 day; the amount of theory and practice varied from 0 to 32 hours and 0 to 40 hours respectively. More of the teaching hospitals than of the nonteaching hospitals (43.6% [44/101] v. 25.2% [111/440]) offered orientation courses; the same was true for the level 3 institutions in comparison with level 1 and 2 centres (71.4% [20/28], 22.5% [86/382] and 39.8% [49/123] respectively). Most (383 [93.9%]) of the 408 respondents in the hospitals with monitors who answered this question reported that nurses working in obstetrics should have basic certification in EFM: 275 (71.8%) indicated that training is essential and 100 (26.1%) that it is desirable.

Almost half of the respondents (44.8% [187/417]) reported that other courses and workshops on EFM are held in their hospitals, including workshops run by the corporations that produce and market monitors. Like the EFM courses, these workshops last 1 day on average (theory 0 to 66 hours, practical 0 to 33 hours). In addition, a variety of other methods for learning about EFM were reported, including medical rounds, conferences, videos, computer-assisted instruction, perinatal outreach

Table 4: Hospital policy on which patients should receive EFM during labour

Policy	No. (and %) of hospitals
All patients continuously	20 (5.1)
All patients on admission and then only selected high-risk patients	247 (63.0)
Only high-risk patients	77 (19.6)
Other	48 (12.2)
Total	392 (100.0)*

*Data were missing for 27 (6.4%) of the hospitals.

Table 3: EFM practice, by type of hospital

No. of cases monitored*	No. (and %) of hospitals		
	Teaching	Nonteaching	Total
Almost all	77 (81.1)	216 (69.0)	293 (71.8)
Half or more	12 (12.6)	42 (13.4)	54 (13.2)
Less than half	6 (6.3)	55 (17.6)	61 (15.0)
Total	95 (100.0)	313 (100.0)	408 (100.0)†

*Respondents were asked how many women in practice are monitored at some point during labour.
 †Data were missing for 11 (2.6%) of the hospitals.

programs, self-learning packages, occasional hospital in-service sessions and teleconferences. Other comments made by the respondents included the need for regular physician updates and national guidelines and the difficulty experienced by staff in small hospitals in maintaining EFM skills.

Discussion

Our findings demonstrate that EFM is widely used in hospitals providing obstetric services across Canada. With 76.3% of the hospitals having at least one monitor and most (71.8%) reporting that they monitor almost all their patients at some point during labour, there is a need for practice guidelines. A question for future research is Would standard educational programs incorporating both EFM and auscultation as well as highly specified interpretation and intervention protocols for obstetricians, family physicians, midwives and nurses affect perinatal outcome?

Our survey showed that 21.6% (88/408) of the hospitals had no written standards specifically related to EFM, and the standards that were received from 232 of the respondents varied considerably in their organizational structure and level of detail. For example, the length of the policies ranged from 1 to 30 pages. In these days of cost constraint, policy development by individual institutions does not seem to be cost-effective. It would be much more logical to have a national multidisciplinary group reach a consensus about policies, procedures and standards. The high rate of responses to our survey indicates that health care professionals are interested and concerned about EFM practices.

Well-developed course materials were received from a few of the centres in British Columbia, Alberta, Saskatchewan, Ontario and Nova Scotia. It would be ideal if these centres could collaborate, share materials and develop successful teaching and evaluation strategies from a multidisciplinary perspective. Additional research is needed to develop reliable and valid tools to measure competence. A clinical decision-making component should be included in any educational research program. Clinical application of knowledge will be essential for any impact on perinatal outcome.

During the review of the EFM policies received we noted that the responsibilities assigned for nursing and medical decision-making varied. In a small proportion of the hospitals a physician's order was explicitly required to initiate EFM. In other institutions it was clearly a nurse's responsibility to initiate EFM in specified high-risk situations. One excellent, clearly written protocol outlined a specific chain of command to follow when a problem occurs. To promote optimum patient care and minimize inter-

disciplinary professional conflict it would seem important to outline clearly the responsibilities of all health care professionals and specify protocols to be used in the event of abnormal tracings.

Only three of the policy documents included any mention of the dimension of psychosocial care for the woman and her partner. Having a written policy related to this topic does not ensure psychosocial care, but it does reflect a minimum expectation or standard and may begin to address consumer concerns about dehumanized health care and the emphasis on machine-oriented reproductive technology.^{23,24}

Summary

Most Canadian hospitals have electronic fetal monitors and use them frequently. Although substantial research has questioned the benefits of EFM, further definitive research is required. In the meantime we recommend that a national committee be established to develop multidisciplinary guidelines for intrapartum fetal assessment. These guidelines should include recommendations for standardized educational programs for health care professionals as well as protocols for practice in teaching and nonteaching hospitals.

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Conferences

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Sept. 4-10, 1993: 15th World Congress of Neurology (sponsored by the World Federation of Neurology and the Canadian Neurological Society)

Vancouver

Secretariat, 645-375 Water St., Vancouver, BC V6B 5C6; tel (604) 681-5226, fax (604) 681-2503

Sept. 5-10, 1993: Challenges in a Changing World — Psychogeriatrics at the Turn of the 21st Century: 6th Congress of the International Psychogeriatric Association (IPA)

Berlin, Germany

Abstract deadline: Apr. 30, 1993

Official language: English

6th Congress of the IPA, GEROCON Geriatric Medicine, Consulting GmbH, Im Hoppenkamp 4, 5060 Bergisch-Gladbach 1, Germany; tel 011-49-2204-5-20-14, fax 011-49-2204-5-20-15

Sept. 7-10, 1993: 6th International Congress on Interventional Ultrasound

Copenhagen, Denmark

Christian Nolsoe, Congress Secretary, Department of Ultrasound, Herlev Hospital, University of Copenhagen, DK-2730 Herlev, Denmark

Sept. 10, 1993: Health Care Aide Clinic Day
North York, Ont.

Sybil Gilinsky, Continuing Education Department, Baycrest Centre for Geriatric Care, 3560 Bathurst St., North York, ON M6A 2E1; tel (416) 789-5131, ext. 2365

Sept. 20-22, 1993: Alzheimer's Disease International 9th Annual Conference — Global Challenge, Local Action
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Alzheimer Society of Canada, 201-1320 Yonge St., Toronto, ON M4T 1X2; tel (416) 925-3552, fax (416) 925-1649

Sept. 27-29, 1993: 1st International Conference on Community Health Nursing Research
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