ORIGINAL ARTICLE

Influence of a Targeted Educational Intervention on Evidence-based Practice in Two Malaysian Maternity Units: The SEA ORCHID Project in Malaysia

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SUMMARY

We conducted a before and after study to determine whether an educational intervention to build capacity in the understanding and implementation of evidence could result in improved outcomes for mothers and babies in obstetric and neonatal units of two Malaysian hospitals. Twelve practices and thirteen associated outcomes were selected based on clear evidence from the Cochrane Library. There were significant improvements in most practices with little change in outcomes. In the short term a targeted intervention to build capacity in the understanding and implementation of evidence results in an improved process of care without adverse outcomes.

KEY WORDS:
Evidence-based practice, Knowledge translation, Obstetric practices

INTRODUCTION

It has been stated that providing access to reliable health information for workers in developing countries is potentially the single most cost effective and achievable strategy for sustainable improvement in health care[1]. Information provision alone however is not enough; we need to ensure that clinical practice changes in response to that information. While little is known about the best ways to change the behaviour of health care workers and so to implement available evidence, we do know that it is a complex process requiring access to information, the skills to interpret that information, and a sense of having contributed to the process. Effective enablers to change include educational outreach[2], use of opinion leaders[3], audit and feedback[4] and interactive educational sessions, while didactic educational sessions appear to have little if any impact[5].

A variety of problems are caused when clinical practices that are not based on sound scientific evidence are incorporated into established medical or health care practice. Valuable resources continue to be used for practices of unknown effectiveness such as routine ultrasound assessment during pregnancy, electronic foetal monitoring during labour, and routine episiotomy during the birth of a baby. On the other hand interventions that have been shown to be both cheap and effective, such as antenatal steroids for the prevention of neonatal mortality after preterm birth, have not been widely implemented[6]. In an empirical example of clinical practice being at odds with published recommendations, a study conducted in South East Asia (six centres) and the United States of America (two centres) demonstrated large variation in the use of antibiotic prophylaxis in caesarean section, despite there being strong evidence supporting its use. Only two of the eight participating centres routinely administered appropriate regimens of antibiotic at the appropriate time[7].

The project entitled, Optimising Reproductive and Child Health in Developing Countries in South East Asia, (SEA ORCHID), was designed to answer the question, 'Can the health of mothers and babies in Thailand, Indonesia, Philippines and Malaysia be improved by increasing capacity for the synthesis of research, implementation of effective interventions, and identification of gaps in knowledge needing further research in those countries?' Two Malaysian centres took part in this project. This paper, derived from that work, evaluates whether a targeted intervention to build capacity in the generation, evaluation and implementation of relevant evidence can lead to improved process of care and outcomes for women and babies in two Malaysian centres.

MATERIALS AND METHODS

Study Design

The SEA ORCHID project was set in nine centres in four South East Asian countries (Thailand, Malaysia, Philippines and Indonesia) with support from three Australian Universities (The University of Sydney, The University of Adelaide and Monash University). The two Malaysian centres, selected because they were participating centres in the project, were Hospital Raja Permaisuri Bainun, Ipoh and Universiti Sains Malaysia, Kubang Kerian. Within these institutions the intervention mainly involved the Obstetric and Neonatal Units and staffing in these units was fairly stable over the study period. It was a before and after study with three main phases. The details of these and the methods have previously been described[8, 9]. Briefly, in the pre-intervention phase the primary data consisted of an audit of 12 areas of recommended practice and 13 health outcomes in pregnancy, childbirth and neonatal care. Areas of recommended practice and associated intended health outcomes were selected based

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on support by clear evidence from Cochrane systematic reviews. The recommended practices and health outcomes assessed are summarized in Table I.

Secondary data included a survey with questions on staff knowledge of evidence-based practice, and access to evidence. The survey was conducted to consenting staff in the paediatric and obstetric departments of the participating hospitals. The second phase consisted of an educational intervention. In the third phase the audit was repeated.

Intervention
A logical framework was developed to define the intervention. This was implemented within an action research framework using a plan-act-reflect circle. The details of this process have been published elsewhere [9]. This resulted in an intervention, designed locally and tailored to meet the specific needs of each site. It focused on users of evidence (clinicians and policy makers), generators of evidence and evidence-based materials (systematic review, guideline development and improving research infrastructure), and educators about evidence (teachers and trainers). In Malaysia the intervention focused on users of evidence and generators of evidence in the form of systematic reviews. Since the Malaysian Ministry of Health had its own national clinical practice guideline development initiative we chose to not include this in our intervention.

Clinical educators, two or three from each country, usually mid-career and selected on their ability to act as opinion leaders, underwent a period of training in Australia and then carried out site-specific activities to support building capacity in evidence-based practice tailored to perceived need (four Malaysians).

On return from their training the Malaysian clinical educators organised an educational intervention which included interactive evidence-based practice workshops targeted specifically at all categories of doctors and nurses. All these categories of staff were involved in practice changes. In addition there was training in systematic reviewing and input into undergraduate nursing and medical curricula. Academic exchanges consisted of 1-2 month fellowships to the Australian centres for 23 South East Asian participants (five Malaysians) and teaching tours to the South East Asian centres by Australian educators and investigators. The intervention did not involve the giving of specific top-down orders to change practice. Practical training took place according to perceived need and was individualised to each centre. For example the Malaysian centres offered specific practical training such as protection of the perineum when routine episiotomy was not performed, continuous suture technique for repair of a perineal wound, and perineal massage. Other centres included training on external cephalic version (ECV), delayed cord clamping and uterine massage. During the intervention phase the publishers of the Cochrane Library made this resource available to all study centres. In addition the World Health Organisation (WHO) Reproductive Health Library (RHL) was available on line free of charge. Other initiatives included incorporation of evidence-based practice skills into journal clubs, specialist training sessions and other meetings such as hospital grand rounds, clinical meetings and mortality reviews. Between the two centres there were more than 80 formal training sessions involving over 1500 participants.

Data Collection and Analysis
The primary audit consisted of 1000 deliveries in each centre. Data were extracted from medical records by trained data collectors using a specially designed format and manual and entered into a secure web-based database. A questionnaire was administered to staff in participating departments to examine their sources of health information, beliefs on evidence-based practice, and knowledge and use of the Cochrane Library and World Health Organisation Reproductive Health Library. Pre-intervention data were collected between April and October 2005 and post-intervention between January and June 2008.

Data was analysed using the statistical software STATA. Rates were given as percentages and the difference pre and post intervention was expressed as a percent risk difference (%RD) and 95% confidence interval (95% CI) of the percent risk difference. Data from the two Malaysian centres was pooled and the pre and post intervention risk difference for the outcomes was adjusted for maternal age, gestation and parity. For the staff survey results were expressed as percentages and p values were calculated to compare responses before and after the intervention. A 5% significance level was used.

The SEA ORCHID project was approved by the ethics committee at the project administration centre, University of Sydney and at each participating centre.

RESULTS

In Malaysia there were a total of 2379 women in the pre intervention and 2249 in the post intervention sample. The characteristics of the women and infants are shown in Table II. There were significantly more women who underwent caesarean birth post intervention for both centres, with an increase from 21.1 to 31.3 percent in Hospital A and 16.9 to 21.8 percent in Hospital B, (p=0.02). There were also significantly more infants post intervention with an Apgar < 7 at one minute (overall 3.4 and 5.2%, p=0.006) but no difference at 5 minutes.

Use of Beneficial Forms of Antenatal Care
There was one case of eclamptic fit before and one after the intervention and magnesium sulphate was used for both of these. In Centre A and across both centres there was an overall increase from 24 to 64.6% in the use of magnesium sulphate for pre eclampsia [%RD 40.6(95%CI 24.0 to 57.2)]. There was a significant increase in the use of antenatal steroids in Centre B and across both centres from 68 to 91% [%RD 23.4(5% CI 6.6 to 40.2)]. Offering ECV to women near term with breech presentation increased from 8.7 pre intervention to 18.8% post intervention [%RD 9.99(%% CI 1.0 to 18.8)] but there was no significant increase in the number of women who actually underwent ECV. Details of these are found in Table III.

Use of Beneficial Forms of Intrapartum and Postpartum Care
Family support in labour (by husbands, mothers, sisters or other family member or friend either some or almost all the time) decreased significantly in Centre A from 86 to 67%

Table I: Recommended practices in maternal and perinatal health care

Recommended practice	Outcome intended to reduce
Beneficial forms of care	
Antibiotics for preterm prelabour rupture of membranes (pPROM) [13]	Chorioamnionitis; neonatal sepsis
Corticosteroids prior to preterm birth [14]	Neonatal death; complications of preterm birth
External cephalic version for breech presentation at term [15]	Caesarean section rate; birth trauma
Continuous support during labour [16]	Caesarean section rate
Magnesium sulphate for eclampsia and pre-eclampsia [17-19]	Maternal death; eclampsia
Active management of third stage of labour [20]	Postpartum haemorrhage; maternal death
- early cord clamping and cutting	
- appropriate administration of a prophylactic oxytocic at or after birth of the baby	
- controlled cord traction to deliver the placenta	
Intraoperative antibiotics during caesarean section [21, 22]	Maternal infection
Vacuum extraction (versus forceps) for operative delivery [23]	Perineal injury; postpartum haemorrhage
Immunisation for Hepatitis B[24]	Hepatitis B infection
Forms of care likely to be unnecessary or harmful	
Routine episiotomy [25]	Perineal injury; maternal infection
Routine shaving* [26]	Maternal infection
Routine enemas* [27]	Maternal infection

* No clear evidence from Cochrane reviews to support or refute use, but identified as practices of importance to research and evaluate

Table II: Characteristics of mothers and infants in pre and post intervention surveys

		Centre 1	Centre 2	All
Mother	Pre	n=1249	n=1130	n=2379
	Post	n=1190	n=1059	n=2249
Maternal age (years) [a]	Pre	29 (5.9)	31 (6.4)	30 (6.2)
		n=1249	n=1130	n=2379
	Post	28.6 (5.6)	30 (6.3)	30 (6.3)
		n=1190	n=1055	n=2245
Gestational age at birth (wks) [a]	Pre	38.4 (2.0)	30 (6.3)	30 (6.3)
		n=1245	n=1120	n=2365
	Post	38.1 (2.0)	38.4 (2.0)	38.2(2.0)
		n=1185	n=1059	n=2244
Nulliparous	Pre (%)	35.7	26.6	31.4
		n=1247	n=1125	n=2372
	Post (%)	33.4	30.9	30.9
		n=1189	n=1959	n=2248
Caesarean Birth	Pre (%)	21.1	16.9	19.1
		n=1249	n=1127	n=2376
	Post (%)	31.3[b]	21.8[c]	26.9
		n=1190	n=1059	n=2249
Birth weight (g.) [a]	Pre	3036 (564)	3084 (558)	3084 (558)
		n=1267	n=1136	n=2403
	Post	3014 (543)	3040 (568)	3026 (555)
		n=1202	n=1059	n=2261
Preterm birth <37 weeks	Pre (%)	10.3	9.5	9.9
		n=1263	n=1133	n=2396
	Post (%)	12.1	10.2	11.2
		n=1197	n=1059	n=2256
Apgar <7 at 1 min	Pre (%)	3.9	3.0	3.4
		n=1267	n=1140	n=2407
	Post (%)	5.8	4.5	5.2[d]
		n=1200	1059	n=2259

[a] mean (sd)
Compared with pre intervention [b]p=0.02
Compared with pre intervention [c]p=0.015
Compared with pre intervention [d]p=0.006

Table III: Comparison of practice of beneficial forms of care pre and post intervention in the two centres

	Period	Centre A				Centre B				All	
		Event no.	Total	%	Difference (95%CI)	Event no.	Total	%	Difference (95% CI)	%	Difference (95% CI)
Beneficial Forms of Prenatal Care											
MgSO4 for eclamptic fit	Pre	1	1	100		0	0	-		100	
	Post	0	0	-	-	1	1	100	-	100	-
MgSO4 for pre-eclampsia	Pre	8	18	44.4		4	32	12.5		24	
	Post	35	46	76.1	31.6 (5.6,57.7)	7	19	36.8	24.3(-0.2,48.9)	64.6	40.6(24.0,57.2)
Antenatal corticosteroidsa	Pre	18	27	66.7		9	13	69.2		67.5	
	Post	20	23	87.0	20.3(-2.2,42.8)	20	21	95.2	23.4(6.6,40.2)	90.9	23.4(6.6,40.2)
ECV offered	Pre	7	46	15.2		2	57	3.5		8.7	
	Post	12	56	21.4	6.2(-8.7,21.2)	10	62	22	12.6(2.3,22.9)	18.8	9.9(1.0,18.8)
ECV performed	Pre	4	46	8.7		0	57	0.0		3.9	
	Post	6	56	10.7	2.0(-9.5,13.5)	2	62	3.2	3.2(-1.2,7.6)	6.8	2.9(-3.0,8.8)
Beneficial Forms of intrapartum and postpartum care											
Family support during labourb	Pre	1073	1249	86		362	1120	32		61	
	Post	796	1188	67	-18.9(-22.2,-15.6)	669	1050	64	31.4(27.4,35.4)	65	4.9(2.1,7.7)
Appropriate oxytocicc	Pre	94	984	9.6		10	934	1.1		5.4	
	Post	63	817	7.7	-1.8(-4.4,0.8)	63	828	7.6	6.5(4.6,8.5)	7.7	2.2(0.6,3.9)
Appropriate antibiotic use for caesarean birthd	Pre	1	264	0.4		0	188	0		1	
	Post	0	372	0	-0.4(-1.1,0.4)	1	228	0.4	0.4(-0.4,1.3)	1	(-0.1(-0.6,0.5)
Vacuum extractione	Pre	16	20	80.0		17	20	85.0		82.5	
	Post	35	48	72.9	-7.1(-28.7,14.5)	13	25	52.0	-33(-58.1,-7.9)	65.8	-16.7(-32.8,-0.7)
Perineal suture materialf	Pre	0	880	0		0	625	0		0	
	Post	5	722	1	0.7(0.1,1.3)	376	619	61	60.7(56.9,64.6)	28	(28.4(26.0,30.8)
Perineal suture techniqueg	Pre	1254	1258	68		484	625	77		72	
	Post	1181	1195	72	4.7(0.2,9.2)	204	619	33	-44.4(-49.4,-39.5)	54	-17.6(-21.1,-14.1)
Hepatitis B immunisation	Pre	1254	1258	99.7		1126	1128	99.8		99.7	
	Post	1181	1195	98.8	-0.9(-1.5,-0.2)	1030	1060	97.2	-2.7(-3.7,-1.6)	98.0	-1.7(-2.3,-1.1)

(a) number of women receiving corticosteroids at GA 24-33 wks / number of women giving birth during GA 24-33 wks (Note: denominator for Post intervention excluded congenital malformations, intrauterine death, born before arrival ,and septic criminal abortion))
(b) defines as the proportion of husbands, mothers, sisters, other family members or friends giving either "some/little" of labour or "all/most" support. For post-intervention the time period is first stage
(c) defined as prophylactic administration of Oxytocin or Syntocin at Anterior shoulder or After birth (denominator is total vaginal birth)
(d) defined as given a Single dose of Ampicilin or Cephalosporin After cord clamped (denominator is total Caesareans)
(e) vacuum / vacuum + forceps
(f) rate of use polyglycolic acid suture material (where perineum sutured)
(g) rate of continuous skin closure (where perineum sutured)

Table IV: Comparison of practice of forms of care of no benefit or likely to be harmful for the two centres

	Period	Centre A				Centre B				All	
		Event no.	Total	%	Difference (95%CI)	Event no.	Total	%	Difference (95% CI)	%	Difference (95% CI)
Routine Episiotomy for	Pre	604	985	61.3		290	939	30.9		46.5	
vaginal birth	Post	428	817	52.4	-8.9(-13.5,-4.4)	246	828	29.7	-1.2(-5.5,3.1)	41.0	-5.5(-8.8,-2.2)
Pubic hair shaving	Pre	302	1247	24.2		464	1098	42.5		37.2	
(all modes of birth)	Post	0	1190	0	-24.2(-26.6,-21.8)	539	1055	51.1	8.8(4.6,13.0)	24.0	-8.7(-11.2,-6.1)
Pubic hair shaving	Pre	105	984	10.7		289	912	31.7		20.8	
(Vaginal birth)	Post	0	817	0.0	-10.7(-12.6,-8.7)	420	824	51.0	19.3(14.7,23.6)	25.6	4.8(2.0,7.6)
Enema use	Pre	28	1247	2.2		479	1095	43.7		21.6	
	Post	0	1190	0	-2.2(-3.1,-1.4)	510	1049	48.6	4.9(0.7,9.1)	22.8	1.1(-1.3,3.5)

Table V: Unadjusted outcomes for each hospital and combined adjusted outcomes

Outcome		Hospital A		Hospital B		Malaysia			
		Rate (%)	RD (95% CI)[b]	Rate (%)	RD (95% CI)	Rate (%)	RD (95% CI)	Adjusted RD (95% CI)	Adjusted Factors[a]
Stillbirth	Pre	0.5	0.2	1.0	-0.2	0.75	-0.04	0.21	P, CS, M, GA
	Post	0.6	(-0.6 to 1.1)	0.8	(-1.0 to 0.6)	0.70	(-0.53 to 0.44)	(-0.38 to 0.08)	
Perinatal Death[c]	Pre	1.1	0.2	1.2	-0.04	1.16	0.25	0.15	P, CS, M, GA
	Post	1.3	(-0.6 to 1.1)	1.5	(-0.53 to 0.44)	1.41	(-0.40 to 0.89)	(-0.67 to 0.93)	
Birth asphyxia	Pre	1.3	0.0	1.4	0.2	1.37	0.21	0.13	P, CS, M, GA
(Apgar < 7 at 5 mins)	Post	1.3	(-0.9 to 0.9)	1.9	(-0.5 to 0.9)	1.58	(-0.49 to 0.91)	(-0.67 to 0.93)	
Severe Birth Asphyxia	Pre	0.6	0.4	1.1	0.2	0.83	0.24	0.30	P, CS, M, GA
(Apgar <4 at 5 mins)	Post	0.1	(-0.3 to 1.1)	1.2	(-0.3 to 0.8)	1.07	(-0.33 to 0.81)	(-0.29 to 0.88)	
Caesarean section	Pre	21.1	10.2	16.9	7.7	19.1	7.8	7.6	P, M, GA
	Post	31.3	(6.7 to 13.7)	21.8	(5.3 to 10.2)	26.9	(5.3 to 10.2)	(2.9 to 12.2)	
Eclampsia	Pre	0.1	-0.1	0.0	0.0	0.04	0.00	-0.18	P, CS, M, GA
	Post	0	(-0.2 to 0.1)	0.1	(-0.1 to 0.1)	0.04	(-0.12 to 0.12)	(-0.94 to 0.57)	
Intact perineum	Pre	10.2	2.3	30.0	-1,5	19.9	-1.50	1.26	P, M, GA
(vaginal birth)	Post	12.5	(-0.6 to 5.3)	24.2	(-4.1 to 1.1)	18.4	(-4.08 to 10.9)	(-1.70 to 4.22)	
Intact perineum	Pre	26.2	0.0	43.5	-6.0	37.1	-6.00	-5.37	P, M, GA
(vaginal birth no episiotomy)	Post	26.2	(-6.2 to 6.2)	34.4	(-10.1 to -1.8)	31.1	(-10.14 to -1.85)	(-13.34 to 2.60)	
Postpartum haemorrhage > 500mls, *(vaginal birth)*	Pre	1.9	1.4	0.5	1.2	1.24	1.25	1.30	P, M, GA
	Post	3.3	(-0.1 to 2.9)	1.7	0.3 to 2.1	2.50	(0.34 to 2.15)	(-0.55 to 0.85)	
Severe postpartum haemorrhage >1000mls *(vaginal birth)*	Pre	0.5	-0.3	0.2	0.0	0.36	0.00	0.12	P, GA
	Post	0.2	(-0.8 to 0.3)	0.5	(-0.4 to 0.4)	0.37	(-0.40 to 0.40)	(-0.58 to 0.81)	
Postpartum pyrexia	Pre	0.5	0.2	0.2	0.3	0.37	0.29	0.15	P, M, GA
(vaginal birth)	Post	0.7	(-0.5 to 1.0)	0.5	(-0.2 to 0.8)	0.66	(-0.24 to 0.82)	(-0.55 to 0.85)	
Postpartum pyrexia	Pre	1.5	0.9	1.1	0.7	1.32	0.69	0.82	P, M, GA
(Caesarean section)	Post	2.4	(-1.2 to 3.0)	1.3	(-0.9 to 2.2)	2.01	(-0.85 to 2.23)	(-1.53 to 3.17)	

[a]Adjusted factors, P= parity, CS= Caesarean section, M= Maternal age (<20, 20-34, >34 years), GA = gestational age (<37 weeks).
[b]RD (95% CI) = Risk difference and 95% confidence intervals
[c]Perinatal death= (stillbirth + death before discharge)

Table VI: Responses to staff survey on access to and use of evidence. Results given as percentages

		n	Heard about evidence based medicine (%)[a]	Heard about the CL (%)[a]	Used CL at least once per month (%)[b]	CL Helpful (Yes and sometimes) (%)[b]	Heard about RHL (%)[a]	Have access to RHL (%)[c]	Used RHL at least once per month (%)[c]
Hospital A	Pre	168	47	38	30	43	11	17	11
	Post	400	90[d]	82[d]	83[d]	86[d]	60[d]	75[d]	72[d]
Hospital B	Pre	110	58	45	38	50	9	50	10
	Post	266	73[e]	70[d]	70[d]	79[d]	14d	56[f]	51[e]
Nurse	Pre	176	31	20	9	20	8	9	0
	Post	552	82[d]	73[d]	78[d]	83[d]	53[d]	72[f]	68[d]
Doctor	Pre	67	85	70	43	60	19	31	15
(Training Grades)	Post	67	87[f]	96d	73[d]	803	28[f]	58[f]	53[e]
Specialist	Pre	32	94	97	48	55	13	75	25
	Post	46	93[f]	96[f]	91[d]	96[d]	41[e]	58[f]	47[f]

CL=Cochrane Library, RHL=World Health Organisation Reproductive Health Library
[a] Denominator = total surveyed
[b] Denominator = those who responded yes to Heard about CL
[c] Denominator = those who responded yes to Heard about RHL
[d] p<0.001, e p<0.01, fnot significant

[%RD -18.9((95% CI 22.2 to 15.6)) but increased significantly in Centre B from 32 to 64%, [%RD 31.4(95% CI 27.4 to 35.4)]. The use of an appropriate prophylactic oxytocic (either oxytocin or syntocin (not in combination with ergometrine) at delivery of the anterior shoulder or after birth) was very low in both centres and showed only a small but significant increase from 5.4 to 7.7% [%RD 2.2 (95% CI 0.6 to 3.9)]. Appropriate antibiotic use for Caesarean birth (a single dose of either ampicillin or a cephalosporin after the cord was clamped) was very low in both centres and did not change during the intervention. Vacuum extraction rather than forceps delivery was high pre intervention and did not change post intervention in Centre A but declined significantly from 82.5 to 65.8% post intervention in Centre B ([%RD -16.7 (95% CI -32.8 to -0.7)]. Both centres were able to make a small but significant improvement in the rate of use of polyglycolic acid suture material for perineal repair when it was required. Continuous suture technique for skin closure of perineal wounds was reported to have increased in Centre A but decreased in Centre B. Both centres had very high rates of use of Hepatitis B immunisation both pre and post intervention. Details of these forms of care can be found in Table III.

Use of forms of care of no benefit or likely to be harmful
Centre A experienced a decline in routine episiotomy from 61.3 to 52.4% [%RD -8.9(95% CI -13.5 to -4.4)] while Centre B already had a very low rate, 30.3% but nevertheless further reduced this among nulliparous women from 94 to 72% [%RD 21.8 (95%CI -28.8 to -15.9). In Centre A pubic hair shaving reduced from 24.2 for all modes of birth and 10.7% for vaginal birth to zero for both groups [%RD -24.2(95%CI – 26.6 to - 21.8)] and -10.7(%RD -12.6 to - 8.7)] respectively. In Centre B there was a reduction in pubic hair shaving for all types of births from 37.2 to 24.0%, [%RD -8.7(-11.2 to - 6.1)] and an increase for vaginal births from 20.8 to 25.6%, [%RD 4.8(95%CI 2.0 to 7.6)]. Enema use had a very low rate of use in Centre A and this reduced to zero post intervention, [%RD -2.2(95%CI -3.1 to -1.4)]. Enema use was just above 20% in Centre B and there was no change post intervention. Further details are found in Table IV.

Outcomes
Post intervention there was a significant increase in the unadjusted rate of caesarean birth in both centres, in Hospital A from 21.1 to 31.3% [RD 10.2(95% CI 6.7 to 13.7)] and Hospital B from 16.9 to 21.8% [RD 7.5(95% CI 5.3 to 10.2)]. For both centres the rate was significantly increased from 19.1 pre intervention to 26.9 post intervention [unadjusted RD 7.75(95% CI 5.3 to 10.2)] and this remained after adjustment for parity, maternal age and gestation at birth [adjusted RD 7.56 (2.92 to 12.20)].

There was a decrease in the rate of intact perineum for vaginal births without episiotomy for Hospital B from 43.5 to 34.4 % [RD -6.0(95% CI -10.8 to – 1.8)] and for the combined data 37.1 to 31.1 [RD -6.0 (95% CI -10.1 to -1.9)] but this was not significant after adjustment for parity, maternal age and gestational age at birth [adjusted RD -5.7(95%CI -13.3 to 2.6)]. There were increases in post partum haemorrhage ≥500mls in both hospital and this was significant for Hospital B from 0.5 to 1.7 [RD 1.2 (95% CI 0.3 to 2.1)] and for the combined data from 1.24 to 2.50% [RD 1.25 (95% CI 0.34 to 2.15)] but this was not significant after adjusted for parity, maternal age and gestational age [adjusted RD 1.30(95% CI -0.55 to 0.85)]. Further details shown in Table V.

Evidence Based Practice Survey
There were 278 and 666 respondents in the pre and post intervention surveys. Significantly more nurses responded to the post intervention survey, 63 versus 82%. For both centres post intervention there was a significant increase in the proportion of nurses who had heard of evidence-based practice from 31 to 80%, ($p < 0.001$) and an increase in the proportion of nurses from 20 to 73% ($p<0.001$) and trainee doctors from 70 to 96% ($p< 0.001$) who had heard about the Cochrane Library (CL). For both centres and all grades of staff there was a significant increase in the proportion who used the CL at least once per month and found it helpful at least sometimes. There was also an increase in both Hospital A and Hospital B and among nurses who had heard of the WHO RHL and more nurses accessed it at least once a month significantly more found it helpful. Details of the results of this survey are shown in Table VI.

DISCUSSION

This study has shown that an educational intervention to build capacity in understanding and using evidence, conducted in the Obstetric and Neonatal Units in two Malaysian Hospitals, resulted in significant improvements in the use of evidence-based practices but in the short duration of the study had little impact on outcomes. At the end of the intervention staff reported that they accessed evidence-based sources of information more frequently and more of them found it useful.

Although there was improvement in most of the 12 practices we chose to study, for some we achieved only a modest improvement and for one or two practices there appeared to be a decline. This modest improvement may have been due to our emphasis during the intervention on building capacity. We did not intend a 'top-down' enforcement of implementation of evidence-based practices and we intentionally did not direct change but allowed centres to examine the evidence and bring about change. Each centre designed its own intervention centred on perceived need. This resulted in a varied emphasis between centres for specific practices and in part explains why some practices did not change. Departments were trained in the generic skills on the use of and implementation of evidence to bring about change. The advantage of this was that staff of all grades now had the skills to go on improving practice and implementing new evidence. A weakness of this study was that the intervention period was only 2.5 years and improvements in some practices may continue beyond this time. An example of this is a restrictive episiotomy practice. It is expected that there will be a continued decline in routine episiotomy since it takes time to implement changes to midwifery and undergraduate medical curricula to include training on conducting a normal birth without an episiotomy and the subsequent graduation of students taught the new curricula.

The approach of developing a tailored intervention around capacity building in the use of evidence was used in a cluster randomised controlled trial. The intervention used in this trial had similarities with our intervention but it was standardised across the participating centres and focused on

the use of the WHO RHL [10]. This study was not able to demonstrate any substantial change in practice using this approach. Other studies have evaluated the effect of individual or grouped components on practices but not on outcomes [11, 12].

Post intervention there was a decline in the use of family support in labour. Labour room staff reported the amount of family support provided by husbands or other family members during each delivery. In one hospital reports were higher pre intervention than post intervention and staff thought the reason for this was that pre intervention they did not fully understand the process of providing support and hence over reported it pre-intervention. Although a decline was reported staff felt that effective family support in labour was more frequently provided post intervention. A similar decline in the use of continuous suture technique for perineal wound repairs may have also been due to a lack of understanding pre intervention. In Centre B there was an increase in two practices considered to be of no benefit or harmful (perineal shaving and enema). This was thought to be due to an increase in awareness of patient preferences, an important consideration in the implementation of evidence-based practices. Antibiotics were used for caesarean section in both centres but the timing or number of doses was inappropriate. Similarly an oxytocic was used for most births in both centres but the type of oxytocic and the timing was not consistent with the best available evidence. We saw a small but significant increase in ECV being offered but this did not result in an increase in the rate of ECV. This could reflect the counselling process which might be influenced by counselling skills (or lack of them) as well as the obstetric teams own perception of the risk involved in this procedure compared with caesarean birth.

The effects of our intervention were not confined to just the two study centres. One unexpected result of this intervention was that it led to the rates of antenatal corticosteroids for preterm birth and episiotomy were included as National Indicators in the Quality Improvement Programme of Malaysia. Experience learned from these two centres resulted in the development of a one-day course 'How to use the evidence to make clinical decisions'. Trainers were trained from several regional hospitals and in some of these hospitals this course is continuing to be conducted twice a year (personal communication). In addition a nursing course was developed to train nurses to use evidence-based educational methods and best evidence to develop teaching modules for implementing new nursing practices.

There was a significant increase in the rate of caesarean birth in both centres for the two centres combined (both adjusted and unadjusted). We were unable to explain this finding in terms of the intervention and felt it was not related to the intervention and possibly part of a worldwide trend. Apart from this the intervention had very little impact on outcomes. There are several reasons why this may have occurred. Firstly the incidence of some outcomes was very low and a very large dataset would be required to show a difference. Secondly it may take longer than our intervention period to demonstrate a change in outcomes after a change in practice. Thirdly to get an adequate sized sample we combined the two centres for the adjusted analysis. Combining the two centres might hide significant outcomes achieved by one of the centres. However the lack of effect on outcomes does show at least that these changes in practice did not adversely affect outcomes.

CONCLUSION

In conclusion a targeted intervention to increase skills in understanding and implementing evidence is able to increase use of evidence based practices without any adverse effect on outcomes. This translates into an improved process of care for thousands of Malaysian women both now an in the future. A similar intervention could be applied in other areas of health care.

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