



EFFECT OF THE *MATERNAL CARE MANUAL* FROM THE PERINATAL EDUCATION PROGRAMME ON THE QUALITY OF ANTENATAL AND INTRAPARTUM CARE RENDERED BY MIDWIVES

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Objectives. To assess changes in the quality of antenatal and intrapartum care rendered by midwives following intervention with the *Maternal Care Manual* from the Perinatal Education Programme (PEP).

Design. A prospective controlled study.

Setting. A study town and two control towns in the Eastern Cape.

Subjects. Before the study a sample of files was drawn to provide baseline information. Subsequently all the midwives in the study town studied the manual, following which a second sample of files was drawn.

Outcome measures. A check-list was used to assess antenatal cards and partograms.

Results. The mean score allocated to the four subunits evaluating the front page of the antenatal card in the study town improved significantly ($P = 0.000$) from 58.5% (standard deviation (SD) 20.6) to 74.5% (SD 19.2). No changes occurred in the control towns (47.5% and 52.9%). The score obtained for the completion of the back page also improved significantly ($P = 0.014$), from 69% (SD 13.7) to 75.6% (SD 14.2), with no changes in the control towns. The mean score achieved for the completion of the partogram did not change in the study town or control towns.

Conclusions. The improved scores obtained for the antenatal card in the study town reflects improved quality of antenatal care. Documentation that improved significantly included important aspects of antenatal care, i.e. previous obstetric history, gestational age, special investigations and correct charting of fundal growth. Three of the four subunits that did not improve were already familiar to the midwives before the study. Documentation of the partogram did not improve for reasons outside the control of the PEP.

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Maternal mortality rates in South Africa are unacceptably high (38 - 107 per 100 000 deliveries).^{1,3} Avoidable factors are present in 41 - 73% of deaths, and of these 17 - 62% are health care related.^{1,4,5} Perinatal mortality rates are also unacceptably high, especially in remote regions where rates of 40/1 000 deliveries and higher are reported.^{6,8} Avoidable factors are present in 50 - 58% of perinatal deaths; of these 15 - 19% are health care related.^{7,9} Improving the quality of ante-, intra- and postpartum care must be the main component of any effort to reduce these death rates.⁵

In the South African public sector primary obstetric care services are rendered almost exclusively by midwives. Low-risk antenatal women are only seen once by a physician. Likewise, midwives are fully responsible for the intrapartum care of low-risk women. A physician will only be consulted if departure from normal is noted. In rural regions where there are few physicians the role that midwives play in primary obstetric care is accentuated. Improved care by midwives will, therefore, constitute a key element in any effort to reduce maternal and perinatal mortality rates.

Previous studies have shown that midwives who completed the *Maternal Care* and *Newborn Care* manuals of the Perinatal Education Programme (PEP) significantly improved their cognitive knowledge by 20% and 21%, respectively.¹⁰ The question as to whether this improved knowledge is reflected in improved quality of care may rightfully be asked. A recently published study casts doubt on whether this in fact happens.¹¹ Quality of care is closely related to the correct use of the antenatal card during antenatal care and the partogram during intrapartum care.¹²⁻¹⁵ These two documents are therefore ideally suited to determine quality of care.

The aim of this study was to see whether there were any changes in the quality of antenatal and intrapartum care rendered by midwives who completed the PEP *Maternal Care Manual*. For this purpose information on antenatal cards and partograms was used.

METHOD

A prospective controlled study was undertaken in an area where PEP had not been used before. Three Eastern Cape towns were used, one as the study town and the other two as control towns. The largest of the three towns was selected as the study town. As there is no town of similar size in that region, two smaller towns were chosen as control towns. During a visit before the implementation of the *Maternal Care Manual* in April 1994, the antenatal clinics and hospitals were visited to investigate the documentation to be used, available equipment, facilities for side-room investigations and the availability of special investigations. Medical cover for the midwives working in the antenatal clinics and hospitals and the referral infrastructures from primary levels of care to hospitals were also investigated. Samples of hospital files were identified from the labour registers in all three towns to serve

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as the pre-intervention samples. The samples consisted of 200 files from the study town and 100 each from the control towns. The files were identified by working backwards from the latest entry in the labour ward registers. Exclusion criteria were: private and unbooked patients, those without file numbers, and patients with addresses that fell outside the region served by midwives from the local Regional Services Council.

The *Maternal Care Manual* was subsequently introduced to the 40 midwives in the study town involved with antenatal, intrapartum and postpartum care. The midwives formed small groups and each group appointed one of their members to serve as the group's co-ordinator. The task of each co-ordinator was to distribute the manuals and to arrange and conduct discussions for the group following the completion of each unit in the manual. The groups met every 3 - 4 weeks. One of the midwives in the study town acted as the regional co-ordinator to help the local co-ordinators with problems encountered.

The date set for the completion of the manual was January 1995, following which a waiting period of at least 3 months was to be allowed. Subsequent to the waiting period samples of hospital files were again identified, in the same way as in the pre-intervention sample and using the same exclusion criteria. A hospital clerk in each of the three towns was asked to draw the files for both samples, to photocopy the relevant documents and to post them to the author. The following documents were used: antenatal card, partogram, midwifery admission note and summary of labour.

Random samples of 60 files each were drawn from the pre- and post-intervention study town samples; likewise 30 files each were drawn from the control towns both pre- and post-intervention. Files where both the antenatal card and partogram were missing were not used. Analysis of the quality of care was done on this sample with the proviso that if the numbers were found to be too small a further sample would be drawn.

Antenatal cards and partograms were used to assess quality of care. For this purpose the information on the front and back pages of the antenatal card and partogram were each divided into four subunits to enable comparison before and after intervention. The content of the subunits is summarised in Table I. A check-list was used to measure completeness and correctness of information (i.e. determination of gestational age) on these documents. The identification, description, planning and management of complications that developed were also assessed. More marks were allocated for important information and marks were subtracted for omissions or mistakes. The marks subtracted increased in the event of major omissions or mistakes. The midwifery admission note was used to identify complications that may have been present on admission and the summary of labour was used to ascertain when the second stage of labour commenced.

For ethical reasons the *Maternal Care Manual* was introduced to the 53 midwives in the control towns directly following the

Table I. Antenatal card and partogram used to assess quality of care

Antenatal card	
Front page	General completeness
	Previous obstetric history
	Determination of gestational age
	Routine special investigations
Back page	General completeness
	Notation of fundal height and weight gain
	Presenting part and amount of fetal head palpable above the pelvis
	Blood pressure and proteinuria
Partogram	
	Risk factors and fetal condition
	Maternal condition
	Uterine contractions
	Cervical dilatation and engagement of the presenting part

identification of the post-intervention sample of files. Consent for the study was obtained from the regional and local health authorities. The study protocol was approved by the Ethics Committee of the Faculty of Medicine, University of Stellenbosch.

The validity of the check-list was determined in a pilot study. The totals of the subunits were used in the analysis, with the denominator of each of the subunits differing according to the information on the documents. For this reason the marks were standardised by using percentages. The data were loaded on Epi-Info 6 (version 6.02, 1994) and the statistical analysis was done using the same programme. Bartlett's test was used to determine if the variance of two samples was homogeneous with 95% confidence intervals (CIs). Homogeneous samples were compared with Student's *t*-test, and if the variances differed medians were compared with the Kruskal-Wallis H-test.

RESULTS

The visit before the study revealed that the antenatal card and partogram used in the region corresponded with the documents on which the appropriate units in the *Maternal Care Manual* were based. The available equipment was sufficient to fully implement antenatal and intrapartum care as described in the manual. Access to laboratories for routine special investigations and the retrieval of results was fully functional. Medical cover was available for the midwives working in the antenatal clinics and hospitals and referral infrastructures existed from primary levels of care to the hospitals.

The number of hospital files received from the study town and two control towns is shown in Table II. The date set for the completion of the manual was 31 January 1995. However, some of the midwives asked for postponement to the end of March



1995. In the study town the post-implementation files were collected for the period 17 March - 5 June 1995.

The files received were numbered chronologically. Sixty pre-intervention files were drawn from the study town and 30 from each of the control towns. The same number of post-intervention files were drawn. The study samples, drawn from the chronologically numbered files from each town, consisted of half of the sample files from the first quarter and half from the third quarter of files received. Consecutive files were used,

but if both the antenatal card and the partogram were absent the file was omitted. The pre-intervention files from one of the control towns contained no antenatal cards at all.

The results of the comparison of the pre-intervention and post-intervention files are shown in Tables III, IV and V. In the study town the antenatal card revealed significantly improved levels of care ($P = 0.001 - 0.014$). The antenatal card subunits that improved significantly were: previous obstetric history, determination of gestational age, routine special investigations

Table II. Number of hospital files received from the study town and control towns, pre- and post-intervention

	Study town		Control towns			
	Requested	Received	Town A		Town B	
			Requested	Received	Requested	Received
Pre-intervention	200	147	100	76	100	56
Post-intervention	200	183	100	77	100	62

Table III. Marks allocated to the four subunits on the front page of the antenatal card

	Study town	No. of records	Control town	No. of records	P-value* (rows)
General completeness					
Pre-intervention					
Mean (SD)	76.8 (21.0)	56	66.7 (23.0)	24	0.059
Median	83.3		66.7		
Post-intervention					
Mean (SD)	82.7 (20.6)	56	61.5 (24.6)	48	0.000
Median	83.3		66.7		
P-value* (columns)	0.13		0.39		
Previous obstetric history					
Pre-intervention					
Mean (SD)	58.1 (36.7)	36	67.8 (41.6)	17	0.39
Median	100.0		64.6		
Post-intervention					
Mean (SD)	78.8 (29.3)	38	49.4 (33.9)	30	0.000
Median	100.0		37.5		
P-value* (columns)	0.009		0.11		
Determination of gestational age					
Pre-intervention					
Mean (SD)	38.3 (22.0)	55	21.4 (21.1)	24	0.002
Median	42.9		21.5		
Post-intervention					
Mean (SD)	50.3 (28.0)	56	24.4 (21.0)	48	0.000†
Median	57.1		28.6		
P-value* (columns)	0.014		0.57		
Routine special investigations					
Pre-intervention					
Mean (SD)	68.5 (50.0)	56	63.3 (50.9)	24	0.92
Median	100.0		100.0		
Post-intervention					
Mean (SD)	93.6 (26.4)	56	86.4 (35.6)	48	0.33†
Median	100.0		100.0		
P-value† (columns)	0.001		0.007		

*Student's *t*-test.

†Kruskal-Wallis H-test.



and notation of symphysis pubis-fundus growth and weight gain (Tables III and IV). No changes occurred in the other four subunits. In the control towns a significant improvement ($P = 0.007$) occurred in the subunit on routine special investigations, while no improvements occurred in the other seven subunits (Tables III and IV). With regard to the partogram only, the subunit on uterine contractions (Table V) improved significantly ($P = 0.006$) in the study town. Two subunits did not change and one deteriorated. No changes occurred in the control towns.

The combined total of all four subunits on the front page of the antenatal card (Table VI) showed a significant improvement ($P = 0.000$) in the study town, but no change in the control towns. A similar result was found for the combined total of the back page ($P = 0.014$) of the antenatal card (Table VI). No changes were recorded for the combined total of all four

subunits on the partogram (Table VI) in the study and control towns. A comparison of the pre-intervention files showed that the front page of the antenatal card in the study town was significantly better ($P = 0.045$) than that for the control town from which antenatal cards were received (Table VI). No differences were found between the back page of the antenatal card and the partogram.

DISCUSSION

The goal of PEP is to improve the quality of perinatal care rendered to pregnant women and their newborn babies. This study is therefore of great importance. The study area was ideally suited to the purpose of the study as it is similar to most other rural parts of South Africa.

Table IV. Marks allocated to the four subunits on the back page of the antenatal card

	Study town	No. of records	Control town	No. of records	P-value* (rows)
General completeness					
Pre-intervention					
Mean (SD)	98.7 (4.9)	56	97.6 (6.9)	24	0.42
Median	100.0		100.0		
Post-intervention					
Mean (SD)	99.0 (4.6)	56	97.0 (10.2)	48	0.32 [†]
Median	100.0		100.0		
P-value (columns)	0.78*		0.84 [†]		
Symphysis pubis-fundus growth and weight gain					
Pre-intervention					
Mean (SD)	44.8 (28.8)	56	29.3 (24.1)	24	0.023
Median	45.0		30.0		
Post-intervention					
Mean (SD)	63.9 (27.7)	55	38.4 (26.7)	48	0.000
Median	62.5		35.4		
P-value* (columns)	0.001		0.16		
Presenting part of the fetus and amount of fetal head palpable above the pelvis					
Pre-intervention					
Mean (SD)	30.1 (33.0)	50	49.2 (40.5)	22	0.038
Median	25		50		
Post-intervention					
Mean (SD)	38.4 (40.4)	54	22.2 (32.6)	40	0.041
Median	29.2		0.00		
P-value* (columns)	0.26		0.006		
Blood pressure and proteinuria					
Pre-intervention					
Mean (SD)	89.7 (21.3)	56	76.4 (31.1)	24	0.027
Median	100.0		100.0		
Post-intervention					
Mean (SD)	85.1 (24.2)	56	80.9 (26.8)	48	0.40
Median	100.0		100.0		
P-value* (columns)	0.29		0.41		

* Student's *t*-test.

[†]Kruskal-Wallis H-test.



Table V. Marks allocated to the four subunits on partogram

	Study town	No. of records	Control town	No. of records	P-value* (rows)
Risk factors and monitoring of fetal condition					
Pre-intervention					
Mean (SD)	28.3 (16.3)	34	27.6 (13.8)	54	0.85
Median	27.3		27.3		
Post-intervention					
Mean (SD)	20.2 (15.8)	32	30.3 (18.3)	44	0.014
Median	15.4		30.8		
P-value* (columns)	0.045		0.42		
Observations regarding maternal condition					
Pre-intervention					
Mean (SD)	46.3 (31.8)	34	43.1 (31.2)	54	0.64
Median	43.7		33.3		
Post-intervention					
Mean (SD)	42.3 (22.5)	32	37.5 (26.4)	44	0.41
Median	36.7		33.3		
P-value* (columns)	0.56		0.35		
Recording uterine contractions					
Pre-intervention					
Mean (SD)	68.2 (31.5)	34	80.7 (33.2)	54	0.083
Median	56.3		100.0		
Post-intervention					
Mean (SD)	88.7 (27.2)	32	83.0 (31.9)	44	0.42
Median	100.0		100.0		
P-value* (columns)	0.006		0.74		
Cervical dilatation and amount of fetal head palpable above the pelvic brim					
Pre-intervention					
Mean (SD)	61.5 (32.5)	34	46.5 (38.1)	54	0.061
Median	63.8		50.0		
Post-intervention					
Mean (SD)	64.9 (30.4)	32	43.5 (38.0)	44	0.010
Median	68.4		45.9		
P-value* (columns)	0.66		0.70		

* Student's *t*-test.

Midwives rendering antenatal and intrapartum care record their findings on antenatal cards and partograms, making these documents ideally suited to the assessment of quality of care. Malone *et al.*¹³ showed in their study that the implementation of an antenatal card was the most important aspect that improved quality of care in Kenya. The value of the correct use of the partogram has been proved beyond all doubt.^{14,15}

Fewer patient files were received than requested. The study town and one control town sent more than 70% of the files requested, while the other control town sent approximately 60% (Table II). The most common problem was that the files could not be found. There was no reason to suspect that the files received were not representative of the care received by pregnant and labouring women in the three towns within the public sector.

Although the protocol provided for a 3-month interval before

the post-intervention sample of files was drawn, the latter sample overlapped the date of the final examination by 2 weeks. This was because a proportion of the midwives requested postponement of the examination from January to March. However, the units on antenatal care are the first two in the manual and those describing intrapartum care make up units five to eight. All these units were already completed during the previous year, allowing a sufficient time interval for implementation of new knowledge.

As is to be expected from a study conducted under field conditions, some files did not contain the documents used in the study. Antenatal cards are retained by the patients and are only filed once women have delivered. Women sometimes forgot to bring their cards with them when arriving to give birth. In one control town the cards were not filed; this practice was rectified before the collection of the post-intervention files.



Table VI. Combined totals for the subunits on the front and back pages of the antenatal card and partogram

	Study town	No. of records	Control town	No. of records	P-value* (rows)
Four subunits on the front page of the antenatal card					
Pre-intervention					
Mean (SD)	58.5 (20.6)	56	47.5 (25.7)	24	0.045
Median	61.3		67.5		
Post-intervention					
Mean (SD)	74.5 (19.2)	56	52.9 (19.0)	48	0.000
Median	78.9		65.0		
P-value* (columns)	0.000		0.31		
Four subunits on the back page of the antenatal card					
Pre-intervention					
Mean (SD)	69.0 (13.7)	56	65.9 (14.6)	24	0.36
Median	68.3		65.1		
Post-intervention					
Mean (SD)	75.6 (14.2)	56	64.7 (14.9)	48	0.000
Median	73.9		64.0		
P-value* (columns)	0.014		0.75		
Four subunits on the partogram					
Pre-intervention					
Mean (SD)	44.7 (16.1)	34	38.9 (19.6)	54	0.15
Median	45.8		39.4		
Post-intervention					
Mean (SD)	43.5 (15.7)	32	38.8 (20.4)	44	0.28
Median	42.8		39.6		
P-value* (columns)	0.75		0.97		

*Student's *t*-test.

Partograms were not used when women were admitted in the second stage of labour. Documents were also lost.

A check-list was used as a yardstick to assess the information on the antenatal cards and partograms. This made it possible to assess whether abnormal observations and complications had been identified and accompanied by correct planning and management. How the check-list was used and how its validity was determined is described elsewhere.¹⁶ Intra-observer variation showed a small mean difference. Although a reasonably big random variation did occur for some subunits, the variations were balanced, with sufficient numbers rendering small mean differences.

This study revealed a significant improvement in the quality of antenatal care in the study town subsequent to completion of the *Maternal Care Manual* by the midwives. Four of the eight subunits that were used to evaluate care improved significantly (Tables III and IV). This result is very encouraging as these subunits evaluated important aspects of antenatal care, namely previous obstetric history, determination of gestational age, routine special investigations and the correct notation of fundal growth on the fundal height graph. One of the special investigations that was evaluated was the serological test for syphilis. If the test was not done or if treatment was not given

in the event of a positive result, negative marks were allocated on the check-list. An improvement from 69% to 94% in this subunit (Table III) is therefore important, as congenital syphilis is an important preventable cause of perinatal deaths.^{7,9} The improvement also noted in the control towns could be ascribed to awareness on the part of senior nursing staff that aspects of care were being monitored during the study.

The four subunits on antenatal care that did not improve significantly were — with one exception — aspects that were well mastered (76.8%, 98.7%, 89.7%) before the study (Tables III and IV). Potential for improvement was therefore limited in these areas. However, determination of the presenting part and engagement of the fetal head, which needs to be performed from 34 weeks' gestation onwards, was mostly not done and did not improve following the intervention. This aspect, therefore, will need more emphasis when the *Maternal Care Manual* is revised.

In the study town the information on the partogram only improved with regard to the subunit on uterine contractions (Table V). Although this is disappointing, various factors may have influenced the result. Although an attempt was made to allow only the 16 midwives who studied the manual to work in the labour ward, 9 registered nurses normally working



elsewhere in the hospital also had to do duty there. In addition, intrapartum care is much more dependent on rapid interaction between midwives and doctors than is antenatal care. Doctors were encouraged to study the manual, but with a single exception this did not happen. Although the response by doctors to complications was not studied, it was apparent from the documents that their response was often substandard, which made it difficult for the midwives to correctly apply their knowledge. Another possibility is that the midwives did not understand the units on intrapartum care. However, as described elsewhere, cognitive knowledge, application of knowledge and practical skills of midwives in the study town improved significantly.^{10,17,18}

Most other studies that evaluated the effectiveness of educational programmes on health services did not evaluate quality of care.¹⁹⁻²³ Two studies by Kattwinkel *et al.* and one by Harlan *et al.* studied patient records to determine changes in quality of care following educational programmes.²⁴⁻²⁶ Of these three studies, only one of those by Kattwinkel *et al.*²⁴ provides enough information for critical appraisal, with 28 aspects of neonatal care evaluated. Twelve improved significantly, 15 did not change and one deteriorated. The largest improvement was by 31% and the highest percentage scored 74%. Three of the aspects that did not change were already well mastered before the intervention. The present study compares favourably with the above.²⁴

A recently published paper by Le Roux *et al.*¹¹ indicates that the *Maternal Care Manual* failed to improve the quality of all aspects of both antenatal and intrapartum care that were studied. However the study has certain limitations. No waiting period was allowed for the implementation of new knowledge (in the author's study there was an 11-month interval between the pre- and post-intervention files). In addition, two of the eight aspects of intrapartum care were assessed inappropriately. The manual does not suggest routine fetal weight estimation and clinical pelvimetry on patients during labour. This need only be undertaken in the event of poor progress in an attempt to ascertain the cause thereof. Four of the remaining six aspects evaluated were already well mastered ($\geq 84\%$) before the study.

Le Roux *et al.*¹¹ correctly considered three possible explanations for their results. Firstly, that midwives who did not study the manual may have influenced the results (also possible in this study). Secondly, that midwives may not have had the necessary bargaining power to bring about change. This is a valid argument, especially with regard to the relationship between midwives and doctors. Thirdly, that improved theoretical knowledge does not necessarily lead to change in practice. The latter argument is supported by this study, which found significant improvement in antenatal but not intrapartum care, which is more dependent on the availability of the other support structures required to bring about change. Bobadilla²⁷ also supports this argument by stating that it is very difficult to evaluate the effect of programmes designed to improve the health of pregnant

women, as the outcome is dependent on the effective functioning of a whole system.

This study shows that study of the *Maternal Care Manual* improved the quality of care rendered by midwives. Four of the five aspects of antenatal care that were poor improved significantly. With the exception of one aspect, intrapartum care did not improve. The most plausible explanation for the latter result relates to the role of midwives who did not study the manual, as well as to the role of doctors.

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