

Implementation of a new birth record in three hospitals in Jordan: a study of health system improvement

Reham Khresheh¹ and Lesley Barclay^{2*}

Accepted 13 August 2007

This study tested the introduction of a new integrated clinical record in Jordan where currently no clinical report links antenatal, birth and postnatal care for women. As a result, no continuity of information is provided to clinicians nor are there national statistics on trends, or performance of hospitals around birth. Our study was conducted in the Jordanian Ministry of Health, the maternity wards and registration departments of three hospitals in Jordan and in the Maternal and Child Health Centres located near these hospitals. We used an exploratory, descriptive design and practice-research engagement to investigate and report on the process of change to improve and implement the new birth record. Through engaging practitioners in research, care improved, the quality of reporting changed, managers developed more effective measures of hospital performance and policy makers were provided with information that could form the basis of a national maternity data monitoring system. Quantitative and qualitative audit data demonstrated improved clinical reporting, organizational development and sustained commitment to the new record from clinicians, managers and policy leaders.

Keywords Maternal health services, practice-research engagement, quality assurance, health care quality

KEY MESSAGES

- Clinical information can extend beyond individual patient care to include quality review and improvement processes within health information systems.
- Identifying a shared goal and engaging practitioners and researchers in practical activity to achieve this goal can bring about sustained clinical improvement.
- A Practice Research Engagement process led by a skilled researcher can play a key role in quality improvement beyond the immediate aims of the research project.

Introduction

Efforts to develop a Perinatal National Minimum Data Set have been undertaken in many countries, led by the World Health Organization (World Health Organization 2004). The aim of such data collection is to improve the health of mothers and babies by monitoring perinatal health, as well as providing ongoing information to service providers and policy makers

¹ Lecturer, Faculty of Nursing, Mutah University, PO Box 7, Karak, Jordan.

² Professor of Health Services Development, Institute of Advanced Studies, Charles Darwin University, Darwin, NT, Australia.

* Corresponding author. Institute of Advanced Studies, Charles Darwin University, Darwin, NT 0909, Australia. E-mail: Lesley.Barclay@cdu.edu.au

about trends and patterns in the health status of mothers and babies. Although perinatal surveillance systems are feasible in developed countries, they have still not been implemented widely (Beck *et al.* 2003; Laws and Sullivan 2004). Often where elements of such record systems exist, they are described as fragmented, incompatible, uncoordinated and not comprehensive, and a concerted effort is needed to enable regular monitoring of maternal morbidity and mortality (AbouZahr and Wardlaw 2001). Researchers have stressed that practice could be adversely affected by inaccurate clinical information and that there is an urgent need for the development of standard data-collection tools for collection of high-quality data (Wyatt and Wright 1998; M'kumbuzi *et al.* 2004).

Jordan is geographically small and classified as a developing country with a population of 5.5 million people (World Health Organization 2001). The birth rate is 29/1000 and the fertility rate is high at 3.7 (Department of Statistics 2004). In Jordan, 27 Ministry of Health hospitals provide birth services, with nearby Maternal and Child Health Centres providing antenatal and postnatal care. The record-keeping system in these hospitals and Maternal and Child Health Centres is controlled nationally, resulting in two separately located information systems. Pregnant women's antenatal and postnatal records are held in the community at the Maternal and Child Health Centres, while labour and birth records are in the hospital. There is no system linking the antenatal, birth and postnatal record to provide continuity of information to clinicians, national statistics on trends, or performance of hospitals around birth. Incorrect reporting of maternal and infant mortality and morbidity is likely as there are difficulties in collection and aggregation of poor quality data, with no validation of this or quality controls in place.

Available data are usually based on 'snap shot' research or surveys which are costly to conduct (Nsheiwat and Al-Khalidi 1997; Shihadeh and Al-Najdawi 2001), while large-scale demographic and reproductive health surveys are carried out intermittently (Department of Statistics and Macro International Inc. 1998; Department of Statistics and ORC Macro 2003). Our baseline study confirmed that recording of birth data collected in hospital records was of poor quality, recorded in 18 different places in the hospital record and that insufficient hospital data were returned to the community to inform postnatal care. There were other concerns including duplication of data that was time consuming for the recorder, with frequent gaps in information, retrospective completion of

records and clinicians often not reporting on their own care. In addition, pregnant women had no access to their own records and there was no peer review of performance in the health team. Since data were not used for analysis or planning there were no opportunities to 'benchmark' performance individually by clinicians or by the hospital against other hospitals or with international evidence or standards (Khresheh 2006). No published studies or reports are available in Jordan describing professional practice during labour that could be linked to morbidity outcomes, and efforts have been made through research, rather than routine data collections, to explore the causes of mortality (Nsheiwat and Al-Khalidi 1997; Khouri and Masaad 2002). However, a National Information System now being introduced provides an opportunity to combine an 'on line' clinical data entry system with one that can report trends in the safety and quality of birthing services through aggregation of clinical data (National Information Centre 2001).

The study reported here aimed to investigate the feasibility and outcomes of introducing a new birth record shared between hospital and community. The new record, the Jordanian Consolidated Birth Record (JCBR), is based on the NSW Perinatal Data Collection Form (NSW Department of Health 2004) which is part of the Australian perinatal data collection system of national reporting and benchmarking (Laws and Sullivan 2004). It was modified by Jordanian experts to meet Jordanian needs. This Australian tool was chosen for pragmatic reasons because of its accessibility to the researchers. The JCBR consists of eight basic areas, many modified from the Australian tool to suit the Jordanian context. Items include demographic data and information on maternal health, the pregnancy, labour, delivery and perinatal outcomes (see Box 1). Modifications suggested by the Ministry of Health officials included removal of data not applicable to the Jordanian community such as 'aboriginality' and addition of data such as the woman's nationality, occupation, husband's occupation and income, type of health insurance, final diagnosis upon discharge, haemoglobin level, blood grouping and Rh of mother and infant etc.

Our research objectives were to improve the quality of the clinical reporting system, to enhance organizational development through teamwork around data collection and to improve the quality of care by linking community and hospital antenatal, birth and postnatal records. We explored whether the JCBR could be the basis of a national maternity data system

Box 1 Items collected in the new record (JCBR)

Demographic: Record number, national number, hospital name, woman's full name, age, address, date of admission, nationality, occupation for woman and husband, and health insurance.

Maternal health: Number of previous pregnancies, live births and abortions; type of last delivery and number of previous caesarean sections.

Pregnancy: Date of last menstrual period, antenatal care, medical conditions, smoking status.

Labour and delivery: Onset of labour, pain relief or anaesthetics, presentation at birth, type of delivery, perineal status, surgical repair of vagina or perineum, immediate post-natal complications.

Baby: Place of birth, date of birth, sex, plurality, birth weight, estimated gestational age, Apgar scores, resuscitation of baby, breastfeeding initiation, birth defect, admission to NICU.

Discharge notes: Final diagnosis, mother discharge status, baby discharge status, date of discharge for mother and baby, laboratory results for mother, physician treatment and advice.

that would monitor and benchmark maternity care services in Jordan. The results are reported against these objectives.

Methods

Design

The study, begun in January 2004 and completed in October 2005, used an exploratory, descriptive design and an action research approach; practice-research engagement. This approach was chosen because the design allows investigation of a quality improvement process that simultaneously supports change management (Brown 2001). The study drew on a combination of quantitative and qualitative data to compare baseline data with implementation data produced from the new record.

Setting

The study was conducted in three Ministry of Health hospitals (A, B, and C) purposively selected by the Ministry in different regions of Jordan. Two hospitals are peripheral hospitals and one is a tertiary centre. These hospitals provide birthing services for approximately 14 530 women annually (Department of Statistics 2001). The Ministry of Health in Jordan and the Ethics Committee of the University of Technology, Sydney, approved the study. De-identified hospital data were used for the record audit and all participants in the action research study formally consented to participate.

Data collection and analysis

The study consisted of three standardized record audits, pre-implementation baseline data, immediate post-implementation data and a smaller opportunistic evaluation conducted 7 months post-implementation. Qualitative data that describe and explain the change process were collected in each setting from managers, clinicians and medical records staff using focus groups, interviews and standardized questions. Field notes were also kept.

A training programme was conducted in each hospital to prepare health professionals to use the JCBR. This was also an important part of the action research methodology as sharing information from the outset, especially the baseline data which confirmed the nature of the problem, was helpful in motivating participants to work together to improve their record keeping. Clinicians were also encouraged to complete the JCBR contemporaneously, rather than retrospectively.

A detailed coding sheet was developed for manually coding audit data from records. This sheet collected completeness of record, errors, persons/role of person completing the record as well as clinical data. This coding sheet was tested pre-baseline, modified slightly and then used for baseline assessments, post-implementation and for the longer term follow-up.

The first record audit was with a random sample of 180 records, 60 from each hospital, of women who gave birth in 2003. This sample was considered of sufficient size to convincingly describe the size and nature of the problem. This was compared with results of a second audit post-implementation ($n=1254$) that sampled records of all women who gave birth during 2 months use of the new record. The size of the third

opportunistic audit of 42 records, randomly selected from women who gave birth 7 months after implementation, was estimated to be sufficient to assess the sustainability of the effect of the new record on the quality of reporting and recording of data about mothers and babies. Quantitative data were collected for record audits and analysed using Excel spreadsheets and frequency tabulation.

Nine interviews and three focus groups (spread equally across each of three participating hospitals) were undertaken before the implementation of the JCBR with a total of 36 people who played key roles at different levels of the health system. This established their opinions of the record. A second round of interviews and focus groups was undertaken immediately after the implementation of the JCBR with clinicians and medical record staff ($n=40$), with mothers ($n=15$) who received their own copy of the JCBR and with Maternal and Child Health Centre staff who provided antenatal and postnatal care ($n=21$). A third round of interviews with hospital staff ($n=23$) occurred concurrently with the 7 months post-implementation audit. Questions explored how the JCBR affected the reporting and recording of data and how staff used the data subsequently. Audio-recorded data from interviews and focus groups were transcribed in Arabic and content analysis was used to identify repetitive themes which are reported qualitatively using text and quotes. Field notes recorded observations made during visits to hospitals, to clinics or during appointments, and were updated daily. Field notes were also analysed for themes, quotes and observations, which have been extracted to exemplify findings reported here.

The field researcher, Khresheh, who is Jordanian and a clinician, worked alongside staff during the implementation in each hospital. During random weekly checks at each hospital the accuracy of data being recorded in the JCBR was assessed, enabling us to see if records had been fully completed, and if not, the type and number of incomplete items, the accuracy of these records compared with the notes in the medical records and the differential participation rates of groups of staff. Consistent with a methodology that promotes change, these visits maintained, or built, the commitment of the participating health professionals as the researcher and participants worked together to analyse and improve results. At each visit, the researcher randomly drew 10 records of participating women. The participation rates of different groups of staff were identified through their signatures, enabling the researcher to identify whether a doctor or midwife or registration worker had completed his or her section. The percentages of completed sections for each different group's signatures were calculated by the researcher (see Figure 3 below).

Results

Quality of clinical records

In pre-implementation audit data, up to 50% of the records were inadequately completed with important clinical information unrecorded. It was also difficult to find this information since records were duplicated and recorded in 18 different places and by up to four different care-providers. In contrast, post-implementation data showed that although completion rates of the JCBR continued to improve over time, even at the

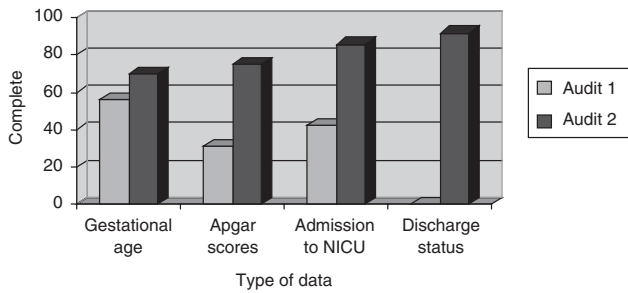


Figure 1 Improvement across a sample of data measuring completeness of record before (Audit 1, *n* = 180) and after the implementation of the JCBR (Audit 2, *n* = 1254) in the three hospitals

Table 1 Improvements in a sample of aggregated data from three hospitals before implementation (Audit 1), after implementation (Audit 2) and at 7 months post-implementation of the JCBR (Audit 3)

Type of data	Audit 1 (<i>n</i> = 180)		Audit 2 (<i>n</i> = 1254)		Audit 3 (<i>n</i> = 42)	
	No.	%	No.	%	No.	%
Gestation age	101	56	992	79	31	74
Apgar scores	55	31	940	75	25	60
Admission to NICU	75	42	1072	86	24	57
Baby discharge status	-	-	1153	92	7	17

beginning of implementation, quality and completeness were better. By the end of the implementation period, more than 75% of records were fully completed. Hospital A had the best results with more than 78% of the record items completed at the end of implementation, followed by Hospital B then Hospital C. Overall percentages of improvement on a sample of data are shown in Figure 1 and Table 1.¹

The quality and completeness of the recording of important clinical information such as Apgar scores, gestational age, admission to NICU and discharge status improved. Additional data which had not been sufficiently well recorded previously, or were absent from the mother's medical records, were now being collected. This included socio-economic status of the mother; type of last delivery; information on the current pregnancy, for example the date of the first visit to the antenatal clinic and smoking status; complications after delivery; information about breast-feeding initiation and advice for the mother about postnatal care. Now, all this data could be found in one place in the record. Results from the third record audit showed sustained improvement in the completeness rate and the quality of data recorded in the women's medical record (Figure 2 and Table 2).

Qualitative post-implementation data also showed that the JCBR was considered to be useful and valuable for hospital staff, mothers and Maternal and Child Health Centre staff. Hospital staff wanted the JCBR to continue because documentation was easy to complete, took less time and effort, and provided valuable data that assisted their clinical decision-making. For example, one obstetrician said, 'the information on the baby after delivery is very important. I don't know why we didn't record these data before.'

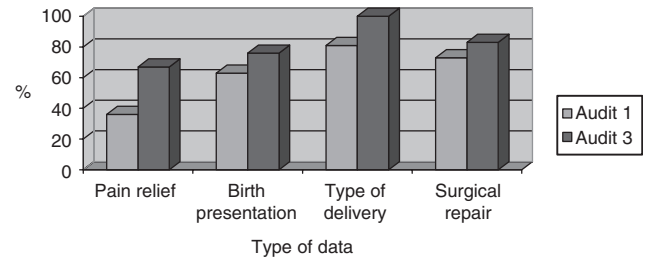


Figure 2 Improvements in a sample of clinical data before (Audit 1, *n* = 180) and 7 months after the implementation of the JCBR (Audit 3, *n* = 42) in the three hospitals

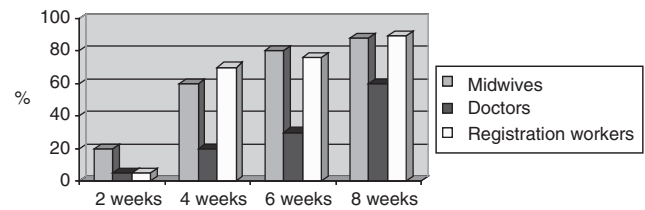


Figure 3 Improvement of staff commitment toward the implementation of the JCBR over 2 months

Table 2 Improvements in a sample of clinical data aggregated across three hospitals before implementation (Audit 1), after implementation (Audit 2) and 7 months post-implementation of the JCBR (Audit 3)

Type of data	Audit 1 (<i>n</i> = 180)		Audit 2 (<i>n</i> = 1254)		Audit 3 (<i>n</i> = 42)	
	No.	%	No.	%	No.	%
Pain relief and anaesthesia	65	36	1074	86	28	67
Presentation at birth	113	63	1163	93	32	76
Type of delivery	145	81	1172	93	42	100
Surgical repair of the vagina or perineum	132	73	1111	89	35	83

Organizational and individual performance

The action research and practice-research engagement process was designed to engage staff in a quality improvement process. Initially we found there was a relatively low commitment by staff to the new system in all departments in each hospital, although commitment by midwives was generally higher than for doctors. Registration workers were less committed in two of the three hospitals. However, commitment and enthusiasm for change gradually improved over time for all groups of health professionals (Figure 3).

The use of JCBR increased the health professionals' sense of responsibility toward the care they provided, their respect for others in the team and the accuracy of data they recorded in the mother's records. As a midwife said, 'everyone had to write and record and sign off the exact care provided to a woman so the next care-provider could continue with the suitable care.'

The managers of the hospitals and clinical directors supported both staff and the field researcher, and contributed to the

positive effect the JCBR had on promoting teamwork and enhancing relationships among health team members. For example, a midwife commented, 'it was team work; we all participated in completing the JCBR.' While a doctor said, 'when I was not sure of something recorded in the JCBR usually I went back to the responsible care-provider for more clarification.' The JCBR also improved the health professionals' record-keeping habits including the timely and accurate completion of the important clinical data record and recording of new clinical data unrecorded previously. The accessibility of data from the JCBR also encouraged some of the health professionals to review their practices for the first time, motivating them to question the current situation. One resident doctor demonstrated the enhanced clinical leadership and accountability when he stated, 'at first I found this new record unnecessary, but with time I valued its importance; we noticed that the majority of mothers have low haemoglobin.'

The implementation phase of the research was completed in 2 months. During this time staff undertook a double load as they completed their routine documentation as well as the JCBR. Staff from all three hospitals have continued using the JCBR and are still collecting the statistical summary copies of the new record and sending them to the researcher for analysis.

Creating links between services

Health professionals in the Maternal and Child Health Centres were highly motivated to link community and hospital records. They were aware that information about the course of labour, details of birth and health of the baby influences the quality of postnatal care. For example, one obstetrician said, 'these information systems are of no benefit if they stay like this, without connection. We need complete information if we want to make real improvement.' In interviews and focus groups, staff suggested that client-held records would facilitate integration and that a simple computerized system based on three hard copies of the antenatal record, birth and postnatal record would be feasible. The immediate post-implementation and longer term evaluations, record audits and interviews confirmed the potential of developing a sustainable national hospital-based perinatal information system using the new record and connecting all hospitals and nearby Maternal and Child Health Centres. There is national commitment in Jordan to achieve these links.

Discussion

The study had a number of limitations. This included the positive bias that was introduced by purposive selection of the hospitals and the researcher's attention to the quality of interaction with people. This was intentional and an element of the design. The evaluation conducted after 7 months was opportunistic rather than ideally situated in scope or time from completion to convincingly measure long-term sustainability.

System improvement

The study confirms that clinical information and health information systems can be used for purposes that extend

beyond individual patient care to include quality review and improvement processes. The data produced and their improved quality confirms the claim by others that this information can assist with allocation of resources, budgetary and long-term planning, and productivity measurement (Slagle 1999; World Health Organization 2004).

The process of quality improvement in clinical practice and health system development is complex and challenging. Quality improvement should focus on areas of real importance, the organization should have capable leadership and be prepared to change, and the external environment should encourage change (Shortell *et al.* 1998). In this study, action research, which emphasizes practice-research engagement and is based on theories of change management (Brown 2001), was successful in introducing and managing the change identified by the researcher-practitioner team, as well as investigating this process and its outcomes.

Effective leadership is necessary to manage improvement in clinical practice settings. This leadership involves influencing others to contribute to positive outcomes (Redelmeier and Cialdini 2002). As a result of the researcher working with them, health workers demonstrated increased professionalism, while managers and clinical directors were supportive in creating a simple change that enhanced the working environment in a way that appears to be sustained.

As well as solving the immediate practical clinical record problems, a significant outcome was that the research process helped initiate, develop and maintain new opportunities for professional dialogue as doctors, nurses and midwives worked towards the common goal of improving health care for mothers and babies. This process helped in building a team in a hierarchical environment where professionals were not used to this mode of operating. Practitioners were given the opportunity to work in new ways with medical record workers, nurses and midwives who are usually low status within the system. Obstetricians, at first somewhat sceptical, ultimately responded positively, also finding that teamwork produced better results for their work. Providing women with their own copy of their clinical record facilitated their communication with health professionals.

Proper staff preparation was important and is necessary in any major quality improvement process (USAID 1999). During training, health professionals were educated about the purpose of the study and became committed to the new record. This enabled them to maintain a sense of control, built further support during implementation, and also minimized resistance to change (Henry 1997; Moody *et al.* 2001). Commitment of staff to the process of implementation varied across hospitals and among the health professionals themselves. From the beginning, Hospital A showed the highest commitment of staff while Hospitals B and C began with less commitment but improved over time. It was likely that the relationship between the researcher and the hospital staff contributed, as the researcher was already known to colleagues in Hospital A at the beginning of the study, and she was able to spend more time in the field there because of its close location to her home. Despite this, hospitals B and C also showed significant and sustained improvement.

Midwives and registration workers were initially more committed than doctors to improvement processes. They may have accepted the leadership of the researcher, a female nurse, more readily than the doctors, but this may also be explained by gender issues common in some Arab countries. Overall, because of the strategy and effort of building strong researcher-practitioner relationships, the commitment of all staff improved over this time, including that of male doctors.

The JCBR helped improve the accuracy of data recorded by health professionals, with data now recorded once only by the person providing care, reducing risks of transcription errors. The increased accuracy of data in the JCBR may also be explained by the increased accountability of health professionals toward their data. Important data that were previously not collected such as Apgar scores at birth were now available, were able to be aggregated and could be used for a national reporting system.

Similar to other improvement studies, interaction with practitioners in the field helped to identify problems and plan and initiate solutions during the implementation period (Webb 1990; Nolan and Grant 1993; Brydon-Miller and Greenwood 2003). The reciprocal process, in which the researcher and practitioners informed each other, established new knowledge and effective problem-solving actions. In turn this appeared to develop collaborative relationships with practitioners in the field, to build motivation and to provide practical support. Local and national leaders helped manage and lead this project.

Conclusion

Our study showed that identifying a shared goal and engaging practitioners and researchers in practical activity to achieve this goal can bring about sustained clinical improvement. Clinicians were recording better quality, more useful data collected with increased professionalism following the study. The health professionals were using aggregated information to evaluate their performance and the hospitals could use the data in planning for improvements. The policy makers who supported and guided the study as partners now have a basis to apply the results nationally. They are closer to their goals of consolidating data into electronic records that can be analysed automatically, which provides the capacity to monitor the national maternity system.

Endnote

¹ While all items mentioned in Table 1 were analysed, there were too many items to be presented here or in Tables 2 and 3. Therefore, a sample of items that represent particularly important clinical data that were not collected or inadequately collected previously have been presented.

References

AbouZahr C, Wardlaw T. 2001. Maternal mortality at the end of the decade: signs of progress? *Bulletin of the World Health Organization* **79**: 561–73.

- Beck LF, Johnson CH, Morrow B. 2003. *PRAMS 1999 Surveillance Report: Pregnancy Risk Assessment Monitoring System*. Atlanta, GA: Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.
- Brown LD. 2001. *Practice- Research Engagement and Civil Society in a Globalizing World*. Washington, DC: The Houser Center for Non-profit Organizations.
- Brydon-Miller M, Greenwood D. 2003. Why action research? *Action Research* **1**: 9–27.
- Department of Statistics. 2001. *Statistical Yearbook: Number of Births by Hospitals*. Amman: Ministry of Health.
- Department of Statistics. 2004. *Jordan in Figures 2003*, 6th edn. Amman: Department of Statistics.
- Department of Statistics (Jordan) and Macro International Inc. 1998. *Jordan Population and Family Health Survey 1997*. Calverton, MD: Department of Statistics and Macro International Inc.
- Department of Statistics (Jordan) and ORC Macro. 2003. *Jordan Population and Family Health Survey 2002*. Calverton, MD: Department of Statistics and ORC Macro.
- Henry P. 1997. Overcoming resistance to organisational change. *Journal of the American Dietetic Association* **97**: S145–7.
- Khoury S, Masaad D. 2002. Causes of infant mortality in Jordan. *Saudi Medical Journal* **23**: 432–5.
- Khreshheh R. 2006. Investigating the feasibility of introducing a consolidated birth record: the first step in an information system that identifies outcomes and enables improvement. PhD thesis, University of Technology, Sydney.
- Laws PJ, Sullivan EA. 2004. Australia's mothers and babies 2001. AIHW Cat. No. PER 25. Sydney: AIHW National Perinatal Statistics Unit (Perinatal Statistics Series No. 13).
- M'kumbuzi VRP, Amosun SL, Stewart AV. 2004. Retrieving physiotherapy patient records in selected health care facilities in South Africa- is record keeping compromised?. *Disability and Rehabilitation* **26**: 1110–6.
- Moody G, Choong Y, Greenwood D. 2001. An action research approach to the development of a clinical pathway for women requiring Caesarean sections. *Contemporary Nurse* **11**: 195–205.
- National Information Centre. 2001. *Information age policies and strategies*. Amman, Jordan: National Information Centre.
- Nolan M, Grant G. 1993. Action Research and quality of care: a mechanism for agreeing basic values as a precursor to change. *Journal of Advanced Nursing* **18**: 305–11.
- Nsheiwat M, Al-Khalidi Z. 1997. *Maternal Mortality Study in Jordan's Health Status: Findings from the epidemiological studies and strategies for future surveillance system*. Amman, Jordan: Ministry of Health and Health Care.
- NSW Department of Health. 2004. New South Wales Mothers and Babies 2003. *NSW Public Health Bulletin Supplement* **15**, S-5. Sydney: Centre for Epidemiology and Research, NSW Department of Health.
- Redelmeier DA, Cialdini RB. 2002. Problems for clinical judgment: 5. Principles of influence in medical practice. *Canadian Medical Association Journal* **166**: 1680–4.
- Shihadeh A, Al-Najdawi W. 2001. Forceps or Vacuum extraction: a comparison of maternal and neonatal morbidity. *Eastern Mediterranean Health Journal* **7**: 106–14.
- Shortell SM, Bennett CL, Byck GR. 1998. Assessing the impact of continuous quality improvement on clinical practice: what it will take to accelerate progress. *Milbank Quarterly* **76**: 593–624.
- Slagle TA. 1999. Perinatal information systems for quality improvement: vision for today. *Pediatrics* **103**: 266–76.

- USAID. 1999. *The Comprehensive Postpartum Project*, Jordan. Amman, Jordan: USAID.
- Webb C. 1990. Partners in research. *Nursing Times* **82**: 40–4.
- World Health Organization. 2001. Country profiles, Jordan. Online at <http://www.who.int/countries/jor/en/>, accessed 2 March 2006.
- World Health Organization. 2004. *Developing Health Management Information Systems*. Manila, Philippines: WHO Regional Office for the Western Pacific.
- Wyatt JC, Wright P. 1998. Design should help use of patient's data. *The Lancet* **352**: 1375–8.