

Validation Study of the Western Australian Midwives Notification System

2005 Birth Data

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of the Western Australian
Midwives' Notification System.
2005 Data.

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1. INTRODUCTION

The Western Australian Midwives' Notification System (MNS) is a statutory reporting and data collection system mandated by the *Health Act 1911* (Section 335). This notification system has been operational since July 1974, however computerised records have been maintained since 1980.

The "Health Act (Notification by Midwife) Regulations Form 2 – Notification of Case Attended" form is currently utilised for data collection and reporting for the MNS. For simplicity, this will be referred to as the Midwives' Form 2 throughout this publication.

A Midwives' Form 2 or computerised record is to be completed for every baby born, either stillborn or liveborn, of 400 grams or more birthweight and/or 20 weeks or more gestation occurring in WA. The midwife in attendance usually completes the form.

In the absence of an attending midwife, the medical officer is asked to complete a Midwives' Form 2. If there is no midwife or medical officer in attendance when the birth event occurs, the first qualified midwife or medical officer to attend the mother and baby should complete a Midwives' Form 2.

The Midwives' Form 2 is a three-part form on NCR (No Carbon Required) paper. The copies comprise:

- The 'Health Department Copy' - the original form printed on green paper. This is forwarded to the Department of Health, Western Australia (WA) when details of the discharge of the baby from hospital of birth have been completed.
- The 'Medical Records Copy' - a blue paper form that is retained in the hospital medical records, except in the case of midwives in private practice attending births outside hospital, where it is kept as an individual record.
- The 'Child Health Copy' - a white paper form which is forwarded **within 48 hours of birth** to the Department of Health, WA so that it may be redirected to the appropriate community health nurse to facilitate continuity of care of mother and baby(s).

Please note that multiple births require a separate Midwives' Form 2 for each baby with the same identifying maternal demographic information.

Dependent on the hospital, this form may be in an electronic format. Only one version of the Midwives' Form 2 requires completion (i.e. either a paper or an electronic form – NOT BOTH).

Guidelines for completion of the Midwives' Form 2 are provided to all maternity hospitals across WA and to private practice midwives. The guidelines are designed systematically to assist in the completion of the Midwives' Form 2.

Each year there are approximately 26,000 births in WA. The MNS collects information on maternal demographics, previous and current pregnancies, medical and medical complications, labour and delivery, and infant characteristics for each birth. All forms received by the Department of Health WA are checked for omissions and possible errors. When necessary, the information is verified with the reporting midwife prior to data entry. Checking procedures are additionally performed via inbuilt mechanisms in the computerised database. Despite these system checks, it is still possible for errors to occur. Consequently, it is important to periodically conduct validation studies of the MNS.

2. RATIONALE FOR VALIDATION STUDY

There are three fundamental purposes for conducting a validation study on the MNS. Firstly, this study will provide information on the reliability and validity of the data for users of this database. Secondly, it aims to detect where system inconsistencies are occurring and identify areas for future improvement. As this database is widely accessed, it is imperative that the data provided be as accurate as possible. Thirdly, this database has not been validated since 1994 and is currently well overdue.

Other rationales for conducting this validation study include:

- The conduct of midwifery education in metropolitan and rural, regional and remote hospitals concurrent with data collection visits. This aims to promote accurate completion of the Notification Form.
- Researcher presence in clinical setting aims to enhance professional networks and working relationships between the Maternal and Child Health Unit and clinical midwives.
- Data collection feedback provided to midwives will reinforce the importance of accurate data collection and midwives valued contribution to data collection in WA.
- The availability of reliable data and information is absolutely vital for the planning and evaluation of health services.

3. METHODOLOGY

The validation study was conducted by a project officer with the Maternal and Child Health Unit at the Department of Health WA. The project officer is a Registered Midwife experienced in both the public and private health sectors.

3.1. Case Selection / Sampling

In 2005, there were 26,989 births recorded in WA. From this group, a 2% sample was randomly selected, yielding a sample size of 525 birth records. The study was restricted to maternity hospital births, with homebirths and births at non-maternity hospitals excluded from the eligible dataset. For multiple births, only the first child born was included in the study.

Maternity hospitals were selected for inclusion in the study if they had more than 100 births in 2005. It was not deemed financially feasible for the researcher to personally visit each hospital to collect data where less than 2 birth records were eligible. Selection of study sample via hospital category is detailed in Table 1 below. The hospitals included in this study are outlined in Table 2 below.

525 birth records for 2005 were randomly selected from the MNS utilising the SAS (Statistical Analysis System) computer program (version 9.1). An additional 5 records were also randomly selected for each participating hospital for utilisation in the event that a birth record was misplaced or unavailable when the researcher attended the hospital.

WA Hospitals have been categorised to ensure that a broad cross section of selected data was representative of the total sample population. For the purpose of this validation study, Peel Health Campus (Mandurah) is classified as a metropolitan hospital. Additionally, hospitals offering concurrent public and private maternity services, such as Joondalup Health Campus and the Peel Health Campus, have been classified as private hospitals.

Table 1: 2005 Validation Study - Selection of Study Sample

Hospital Category	Number of Hospitals per Category	Births 2005	Validation Sample
Metropolitan Teaching	1	5043	101
Metropolitan Public	7	6340	127
Private	10	10711	213
Country Public	13	4079	84
Homebirths	0	155	Excluded
Non-Maternity Hospitals	21	660	Excluded
TOTAL	52	26,989	525

Table 2: Hospitals included in validation study

Hospital Category	Hospitals Included	Births 2005	Validation Sample
Metropolitan Teaching	King Edward Memorial	5043	101
Metropolitan Public	Armadale/Kelmscott, Osborne Park, Swan District, Kalamunda Woodside, Bentley and Rockingham/Kwinana	6340	127
Private	SJOG Subiaco, Murdoch, Bunbury and Geraldton, Attadale, Glengarry, Joondalup, Mercy, Peel, Coastal Private	10711	213
Country Public	Albany, Bunbury, Derby, Geraldton, Kalgoorlie, Narrogin, Northam, Port Hedland, Broome, Busselton, Collie, Katanning and Nickol Bay (Karratha)	4079	84
TOTAL	31	26173	525

3.2. Study Conduct

An initial letter was sent to the Chief Executive Officer of each hospital selected to inform them of the study and to request access to the medical records. Agreement was received to include all hospitals approached. Following sample selection, a second letter was sent to both the Chief Executive Officer and the Health Information Manager to notify of the medical records required and the date and time of the scheduled visit. Liaison with hospital staff via telephone or email clarified queries related to the study and enabled appointments for the midwifery education sessions to be scheduled. Hospitals were visited over five weeks during July and August 2006.

3.3. Data Collection

Data was collected from medical records (both mother and infant) from 31 WA maternity hospitals and transcribed to the Midwives' Form 2 (see Appendix 1). 27 hospitals were personally visited. The remaining 4 hospitals (Broome, Derby, Nickol Bay and Port Hedland) mailed photocopies of the selected medical records to the researcher to reduce travel costs. Following collection, all data was transcribed to a copy of the MS Access application, "Midwives Data Entry Package" (Version 3.0).

4. DATA ANALYSIS

The 525 birth records included in the audit were compared directly with their originally reported case record now held in the MNS. Comparison was done using the statistical analysis software, SAS.

The data resulting from the medical record audit and held in the MS Access database was considered the benchmark for the MNS data. These case records did have missing or unknown values because some information was not able to be obtained from the Medical Record by the auditor.

Where data was missing in the audit data, the accuracy of data originally reported was not able to be analysed.

Data was compared and analysed for 104 variables on the Midwives' Form 2. These variables are mandatory in the MNS. Variables not compared (non-mandatory) included Maternal Maiden Name, Height, Telephone Number, Date of Last Menstrual Period (LMP), and Certainty of LMP.

For each of the data variables, a percentage of birth records found to be correct was calculated (i.e. the percentage of cases where the value recorded on the MNS record was the same as the value derived from the medical record).

For selected dichotomous variables the sensitivity, specificity, positive predictive value and negative predictive value were calculated as follows:

Table 3: Analysis Values

Status MNS record	Status Audit Record		TOTAL
	Positive	Negative	
Positive	A	B	A + B
Negative	C	D	C + D
Total	A + C	B + D	A + B + C + D

Table 4: Interpreting Analysis Values Assigned

Status	Meaning	Description
A	True Positives	The number of cases with the characteristic that were correctly identified in the MNS database as having the characteristic.
B	False Positives	The number of cases without the characteristic that were incorrectly identified as having the characteristic in the MNS database.
C	False Negatives	The number of cases with the characteristic that were incorrectly identified in the MNS database as not having the characteristic.
D	True Negatives	The number of cases without the characteristic that were correctly identified in the MNS database as not having the characteristic.
A/A+C	Sensitivity	The proportion of those cases that truly have the characteristic that are correctly classified as having it.
D/D+B	Specificity	The proportion of those that do not have the characteristic that are correctly classified as not having it.
A/A+B	Positive Predictive Value	The proportion of cases classified as having a characteristic that correctly do have it.
D/C+D	Negative Predictive value	The proportion of cases classified as not having a characteristic that correctly do not have it.

5. RESULTS

For the 525 selected records, four were unavailable at the time of researcher's visit. This was overcome by auditing four records included as additional records, if required, in the original sampling.

104 mandatory variables were compared in sample cases across both data sets. Nine variables were accurate across all audited records (100% accurate). These included State of Residence, Establishment Code (Hospital), Complications of Pregnancy – Gestational Diabetes, Medical Conditions – Pre-existing Diabetes Mellitus, Born Before Arrival and Plurality. 95 variables differed in each data set.

The remaining 95 mandatory variables were analysed. The analysis results of these variables will be discussed in the order they appear on the Midwives' Form 2 and in the MS Access Midwives Data Entry Package (versions 3.0 and 3.2).

A comparison of the validation study sample with the 2005 birth population is presented below in Table 5. Generally, the validation sample was representative of the target population except with regards to multiple births. Multiple births are under represented in the validation study sample due to the method of sample selection.

Table 5: Audit Sample and Whole Population Profiles

Data Variable	Sample Records (n=525) (%)	2005 Births (n=26,173) (%)
Onset Of Labour		
Spontaneous	22.5	29.2
Spontaneous & Augmented	26.1	20.2
Induced	27.0	28.6
No Labour	24.4	22.0
Type of Delivery		
Spontaneous Vaginal	48.4	53.5
Vacuum	13.1	9.9
Forceps	3.1	2.4
Elective Caesarean	21.5	19.1
Emergency Caesarean	13.7	14.7
Vaginal Breech	0.2	0.4
Infant Sex		
Male	51.8	51.0
Female	48.2	49.0
Birth Plurality		
Singleton	98.9	96.7
Multiple	1.1	3.3
Infant Condition At Birth		
Liveborn	99.4	99.3
Stillborn	0.6	0.7

5.1. Analysis of Results

5.1.1. Demographic Details

Table 6: Audit Results - Demographics

Data Item	Number Records Correct	Number Records Incorrect	Data not found in Medical Record	Proportion Records Correct (%) n = 525
Surname	507	18		96.7
Forename1	512	13		97.5
Mat Unit Record Number	520	5		99.0
Maternal Date of Birth	518	7		98.7
Address Line 1	396	129		75.4
Suburb or City	507	18		96.6
State	525	0		100.0
Postcode	513	12		97.7
Establishment	525	0		100.0
Ward	326	199		62.1
Marital Status	487	38		92.8
Ethnicity	494	31		94.1

Surname

Apart from minor differences in the spelling or data entry of a surname in 16 cases (e.g. Woollett instead of Woollett or O Halloran instead of O'Halloran) there were 2 cases where surnames were different. In both cases, forename had been entered instead of surname.

Forename 1

Apart from minor differences in the spelling or data entry of a name in 11 cases (e.g. Margariet instead of Margaret) there were two cases where forenames were different. In both cases, surname had been entered instead of forename. These were the same cases as those above.

Maternal Medical Unit Record Number

Maternal medical unit record numbers differed in 5 cases. In each case only one number was different.

Maternal Date of Birth

Maternal birth dates differed in 7 cases. In each case they were different by one digit.

Address Line 1

There were 129 differences in address. Of these differences, only two were completely different addresses, with 127 being minor spelling or data entry discrepancies.

Suburb or City

There were 18 differences in suburb/city. Interestingly only one of these cases appeared as different in the address variable. The suburbs in 9 cases were completely different in the data sets, whereas 8 were similar, differing geographically by one suburb.

State

State of residence was identified correctly in both data sets.

Postcode

Postcode differed in 12 observations. Each of these observations appeared as differences in suburb/city also.

Establishment

The establishment variable was correctly identified in each data set.

Ward

The ward was incorrectly identified in 199 cases. This figure initially appears falsely alarming, however, this can be attributed primarily to the different options of ward available in each computer data entry package at various hospitals, which were not available on the data collection tool. Additionally, many differences occurred as the researcher was unfamiliar with the specific name of the ward and if not recorded in the medical record, the ward was documented as 'Maternity'. 69 records on the MNS recorded a particular ward name, whereas 130 cases recorded 'Delivery Suite', as compared to 'Maternity' by the researcher.

Marital Status

Marital status differed in 38 cases. Differences in the married (including defacto) and single observations were the predominant discrepancy, accounting for 25 differences. This could possibly be attributed to definition uncertainty surrounding what constitutes being single versus being defacto.

Ethnicity

Ethnicity differed in 31 cases. The documented maternal country of birth was utilised to inform ethnicity in this study. Midwives in the clinical setting have an added advantage of visualising the client to inform ethnicity (e.g. a woman may have been born in Thailand but be of English origin – this would result in the study identifying the client as Asian, whereas Caucasian ethnicity may have been reported to the MNS).

5.1.2. Pregnancy Details

Table 7: Audit Results - Pregnancy Details

Data Variable	Number Records Correct	Number Records Incorrect	Data not found in medical record	Proportion Records Correct (%) n = 525
Previous Pregnancies	514	11		97.9
Children Now Living	519	6		98.9
Children Born Alive Now Dead	520	5		99.0
Stillbirths	520	5		99.0
Previous Caesarean Sections	521	4		99.2
Caesarean Last Delivery	522	3		99.4
Previous Multiple Birth	521	4		99.2
Expected Due Date	501	24		95.4
Expected Due Date Basis	438	87		83.4
Smoking During Pregnancy	507	18		96.6
Complications Of Pregnancy	434	91		82.7
Threatened Abortion	520	5	1	99.0
Threatened Preterm Labour	518	7	6	98.7
Urinary Tract Infection	514	11	9	97.9
Pre-eclampsia	514	11	10	97.9
APH – placenta praevia	523	2	1	99.6
APH - abruptio	522	3	2	99.4
APH - Other	520	5	4	99.0
Prelabour rupture of membranes	518	7	2	98.7
Gestational Diabetes	525	0		100.0
Other	464	61	61	88.4
Medical Conditions	459	66		87.4
Essential Hypertension	519	6	6	98.9
Pre-existing Diabetes Mellitus	525	0		100.0
Asthma	507	18	12	96.6
Genital Herpes	521	4	4	99.2
Other	445	80	80	90.9
Procedures/Treatments	482	43	43	84.8
Intended place of birth at onset of labour	516	9		98.3

Previous Pregnancies

11 differences occurred between the data sets. Of these differences, each observation from the MNS differed by at least one digit and in each case was recorded higher. This highlights the need for clarification and education in the clinical setting concerning the fact that the number of previous pregnancies to be recorded EXCLUDES the current pregnancy.

Children Now Living

For this variable 6 differences occurred. The majority of collected observations (4) documented a greater number of children born alive though currently deceased. This variable was not always recorded in the 2005 hospital admission, with the researcher investigating previous medical records to gain the correct information. If midwives consulted the pregnancy history solely from the current admission when completing the birth notification this may account for the majority of discrepancies.

Children Born Alive Now Dead

There were 5 differences for this variable between the data sets. In all cases, the researcher recorded zero for this variable as this information was not recorded in pregnancy records for these observations, whereas in the MNS a value of one or two was recorded.

Stillbirths

There were 5 differences for this variable recorded. In all but one case, the researcher recorded zero for this variable, as this information was not available in medical records. In a particular case the MNS had 11 stillbirths recorded that was clearly a data entry error.

Previous Caesarean Sections

4 differences were recorded for this variable.

Caesarean Section Last Delivery

3 differences were recorded for this variable.

Previous Multiple Birth

4 differences were recorded for this variable. In each observation the researcher recorded no previous multiple birth, whereas the MNS recorded an occurrence of a previous multiple birth.

Expected Due Date

24 differences were recorded for expected due date (EDD). In 12 cases EDD differed by one digit, which may be attributed to data entry error. In the remaining 12 cases, EDD differed significantly. The basis of EDD, either ultrasound or clinical signs/dates, may have altered the date recorded.

Expected Due Date Basis

The EDD basis variable recorded 87 differences. The researcher recorded ultrasound as the basis of EDD if this was not recorded in the medical record and the client had had an ultrasound before 20 weeks of pregnancy. On the researcher's data collection form, only two options were available for data entry (1=clinical signs/dates, 2=ultrasound <20weeks). However, certain data entry packages at various establishments have four options available (1=clinical signs/dates, 2=ultrasound < 20 weeks, 3=ultrasound >=20 weeks, and 8=unknown). 2 observations were recorded on the MNS as unknown.

Smoking During Pregnancy

18 differences were recorded for smoking during pregnancy. The researcher recorded 'Yes' to this variable from thorough investigation of the medical records for 16 of the recorded discrepancies.

Complications of Pregnancy

For this variable there are nine complications of pregnancy listed with the additional option to enter more complications under the 'Other' category. These additional complications are coded according to the ICD-10-CM codes.

The number of cases in agreement was 434, indicating a correct percentage of 82.7%. There were 91 differences in data recording between datasets. Of these 91, 61 were recorded under the 'Other' category. The 61 additional data items recorded in the study is primarily attributed to the researcher having access to all medical records for each case which enabled more thorough data entry.

For each of the complications of pregnancy listed on the Midwives' Form 2, the sensitivity, specificity, positive predictive and the negative predictive values have been calculated (see Table 10). For each complication listed, the specificity was high with values of 0.99 or greater. This indicates the high numbers of cases without a characteristic were correctly recorded as not having the characteristic by the MNS. Pre-eclampsia and urinary tract infections were the most poorly recorded in this category, having the highest number of false negative values.

Medical Conditions

This variable consists of a four medical conditions listed with the additional option to enter other medical conditions under the 'Other' category. These additional conditions are coded according to the ICD-10-CM codes.

459 cases had the same data recorded in both datasets (87.4% correct). There were a total of 66 differences in this category. Gestational diabetes was correctly identified in both datasets. The researcher recorded medical conditions under the 'Other' category in 48 more cases than the MNS. Again, having access to all medical records for that birth event enabled the researcher more accurate and thorough data recording.

For each of the medical conditions listed on the Midwives' Form 2, the sensitivity, specificity, positive predictive and the negative predictive values have been calculated (see Table 10). For each medical condition listed, the specificity was high, with values of 0.99 or greater. This indicates the high numbers of cases without a characteristic were correctly recorded as not having the characteristic by the MNS. Asthma was the most poorly recorded in this category, having the highest number of false negative values.

Procedures / Treatments

This variable consists of seven items listed with tick boxes, which do not require completion if the mother did not undergo any procedures or treatment during pregnancy. 43 differences were recorded from medical records. Similarly, having access to all medical records for that birth event enabled the researcher more thorough data entry.

Intended Place of Birth at Onset of Labour

9 differences were recorded for this variable. If the intended place of birth at the onset of labour was not recorded in the medical record, the researcher recorded 'Hospital' for this item. This occurred in 6 cases.

5.1.3. Midwife Details

Name of Midwife

362 differences were identified. This figure is initially falsely alarming; however in all but 31 cases the correct midwife was identified but was recorded with a minor spelling mistake. Additionally, the researcher recorded the full name whereas on the MNS database the forename appeared as an initial in 103 cases. Dependent on the hospital's method of birth notification, the legibility of the reporting midwife's name influenced the information recorded. Only 31 records had completely different midwives' names recorded. In 2 cases the midwife's name was illegible.

Midwife Registration Number

There were 159 differences recorded for this item. Of these, 11 cases had registration numbers that differed by a single digit. The remaining 148 differences occurred due to the unavailability of the registration number in the medical. Where not available, the researcher recorded 9999.

5.1.4. Labour Details

Table 8: Audit Results - Labour Details

Data Item	Number Records Correct	Number Records Incorrect	No Data in medical record	Proportion Records Correct (%) n = 525
Onset of labour	505	20		96.2
Augmentation	500	25		95.2
Induction	502	23		95.6
Analgesia	481	44		91.6
Labour - 1 st Stage	502	23	8	95.6
Labour - 2 nd Stage	519	6		98.9

Onset of Labour

20 differences were detected for this variable. In 8 of these cases, labour was recorded as being 'Induced' whereas it was recorded as 'Spontaneous' in the MNS. From the education sessions conducted with midwives across the 27 hospitals visited, this section of the Midwives' Form 2 was repeatedly reported as one that created confusion. Uncertainty surrounded the definitions of spontaneous onset of labour, augmentation of labour and induction of labour.

Augmentation

25 differences were identified for this variable.

Induction

23 differences were recorded. The number of differences for this item was similar to the number of differences for the Augmentation variable (above). These results reflect clinical uncertainty surrounding the definition of these terms.

Analgesia During Labour

This variable has six items listed with tick boxes. It is mandatory to select one of these options. There were 44 differences recorded. In 14 cases analgesia during labour was not documented in the medical record yet was recorded in the MNS.

Duration of Labour - First Stage

23 differences were recorded, with 8 false negatives and 6 false positives. The remaining 9 discrepancies differed by one to two hours.

Duration of Labour - Second Stage

6 differences were recorded, with 2 false negatives. The remaining 4 discrepancies differed by one to two hours.

5.1.5. Delivery Details

Table 9: Audit Results - Delivery Details

Data Item	Records Correct	Records Incorrect	Data not found in Medical Record	Proportion of Records Correct (%)
Anaesthesia during delivery	477	48		90.9
None	520	5	5	99.0
Local Anaesthesia to Perineum	512	13	13	97.5
Pudendal	525			100.0
Epidural/Caudal	509	16	16	97.0
Spinal	519	6		98.9
General	525			100.0
Other	525			100.0
Complications Labour & Delivery	503	22	22	95.8
Precipitate Delivery	522	3	3	99.4
Fetal Distress	515	10	10	98.1
Prolapsed Cord	524	1	1	99.8
Cord Tight Around Neck	524	1	1	99.8
Cephalopelvic Disproportion	524	1	1	99.8
PPH	522	3	3	99.4
Retained Placenta – Manual Removal	525			100.0
Persistent Occipito Posterior	525			100.0
Shoulder Dystocia	522	3	3	99.4
Failure To Progress <=3cm	524	1	1	99.8
Failure To Progress >3cm	523	2	2	99.6
Previous Caesarean	522	3	3	99.4
Other	476	49	49	90.7
Perineal Status	508	17		96.8

Anaesthesia During Delivery

There were 48 differences detected for this variable. Of these, 27 recorded both epidural and spinal categories, however the MNS had either epidural or spinal for these birth records. This variable allows more than one item to be indicated on the Midwives' Form 2, however, some midwives may not be aware of this and indicate only one item. This fact is not clearly outlined in the current MNS guidelines. False negatives were recorded in 7 cases.

Complications of Labour and Delivery and Reason for Operative Delivery

There are 12 items listed for this variable with tick boxes, with the additional option to enter more complications under the 'Other' category. These additional complications are coded according to the ICD-10-CM codes.

503 cases were in agreement, indicating a correct percentage of 95.8%. 22 differences were identified. For each of the complications of labour and delivery listed on the Midwives' Form 2, the sensitivity, specificity, positive predictive and the negative predictive values have been calculated (see Table 11). For each complication listed, the specificity was high, with values of 0.98 or greater. This indicates the high numbers of cases without a characteristic were correctly recorded as not having the characteristic by the MNS. There were a relatively high number (31) of false positives recorded for post partum haemorrhage (PPH). This may be due to the amount of maternal blood loss being unavailable in these medical records and the difficulty quantifying blood loss in the clinical setting. There were 9 false negatives recorded for elective caesarean section and 10 false positives recorded for emergency caesarean section method of delivery. These similar figures suggest the need for clarification of terminology in the clinical setting and the need for further midwifery education and greater access to the Midwives' Form 2 guidelines.

Perineal Status

For this variable 17 differences were recorded.

Table 10: Sensitivity & Specificity of Audit Results – Pregnancy Details

Data Item	True Positives	True Negatives	False Positives	False Negatives	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Complications of Pregnancy								
Threatened Abortion	2	517	5	1	0.66	0.99	0.29	0.99
Threatened Preterm Labour	3	515	1	6	0.33	0.99	0.75	0.99
Urinary Tract Infection	2	512	2	9	0.18	0.99	0.50	0.98
Preeclampsia	3	511	1	10	0.23	0.99	0.75	0.98
APH–Placenta Praevia	1	522	1	1	0.50	0.99	0.50	0.99
APH–Abruptio	1	521	1	2	0.33	0.99	0.50	0.99
APH-Other	5	515	1	4	0.55	0.99	0.83	0.99
Prelabour Rupture Of Membranes	3	515	5	2	0.60	0.99	0.38	0.99
Gestational Diabetes	5	520			1.00	1.00	1.00	1.00
Medical Conditions								
Essential Hypertension	1	518		6	0.14	1.00	1.00	0.99
Pre-existing Diabetes Mellitus	1	524			1.00	1.00	1.00	1.00
Asthma	8	499	6	12	0.40	0.99	0.57	0.98
Genital Herpes	2	519		4	0.33	1.00	1.00	0.99

Table 11: Sensitivity & Specificity of Audit Results – Delivery Details

Data Item	True Positives	True Negatives	False Positives	False Negatives	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Method of Birth								
Spontaneous		520	1	4		0.99		0.99
Vacuum Successful		520	3	2		0.99		0.99
Vacuum Unsuccessful		522	3			0.99		1.00
Forceps Successful	1	519	5		1.00	0.99	0.17	1.00
Forceps Unsuccessful		524		1		1.00		0.99
Breech (Vaginal)		525				1.00		1.00
Elective Caesarean	2	512	2	9	0.18	0.99	0.50	0.98
Emergency Caesarean	3	511	10	1	0.75	0.98	0.23	0.99

Data Item	True Positives	True Negatives	False Positives	False Negatives	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Analgesia (During Labour)								
None		503	8	14		0.98		0.97
Nitrous Oxide	13	492	9	11	0.54	0.98	0.62	0.98
Intramuscular Narcotics	8	499	12	6	0.57	0.98	0.40	0.99
Epidural/ Caudal	20	486	11	8	0.71	0.98	0.65	0.98
Spinal	1	508	9	7	0.13	0.98	0.10	0.99
Other	1	521	2	1	0.50	0.99	0.33	0.99
Anaesthesia (During Delivery)								
None		518	7			0.99		1.00
Local Anaesthesia	4	502	6	13	0.24	0.99	0.40	0.97
Pudendal	4	519	2		1.00	0.99	0.67	1.00
Epidural/Caudal	17	476	7	25	0.41	0.99	0.71	0.95
Spinal	16	488	9	12	0.57	0.98	0.64	0.98
General		525				1.00		1.00
Other	1	524						
Complications Of Labour & Delivery								
Precipitate Delivery	2	512	8	3	0.40	0.98	0.20	0.99
Fetal Distress	15	494	11	10	0.60	0.98	0.58	0.98
Prolapsed Cord		524		1		1.00		0.99
Cord Tight Around Neck	3	513	8	1	0.75	0.98	0.27	0.99
Cephalopelvic Disproportion	1	521	2	1	0.50	0.99	0.33	0.99
PPH	7	456	31	3	0.70	0.94	0.18	0.99
Retained Placenta – Manual Removal		521	4			0.99		1.00
Persistent Occipito Posterior		522	3			0.99		1.00
Shoulder Dystocia		518	4	3		0.99		0.99
Failure To Progress <=3cm	2	509	13	1	0.67	0.98	0.13	0.99
Failure To Progress >3cm		520	3	2		0.99		0.99
Previous Caesarean		517	5	3		0.99		0.99

5.1.6. Baby Details

Table 12: Audit Results - Baby Details

Data Item	Records Correct	Records Incorrect	Data not found in Medical Records	Proportion of Records Correct (%)
Adoption	523	2		99.6
Born Before Arrival	525			100.0
Baby Birth Date	519	6		98.9
Baby Birth Time	508	17		96.8
Plurality	525			100.0
Presentation	516	9		98.3
Method Of Birth	508	17		96.8
Accoucheur(s)	499	26		95.0
Gender	520	5		99.0
Baby status at Birth	523	2		99.6
Infant Weight	513	12	1	97.7
Length	502	23	3	95.6
Head Circumference	497	28	3	94.7
Time To Establish Unassisted Breathing	512	13	5	97.5
Resuscitation	496	29		94.5
Apgar Score – 1 Minute	518	7	5	98.7
Apgar Score – 5 Minutes	515	10	5	98.1
Estimated Gestation	468	57		89.1
Birth Defects	521	4	3	99.2
Birth Trauma	521	4	4	99.2

Adoption

2 differences were identified for this item. Both differences were false positives (i.e. the infant was incorrectly recorded in the MNS as being for adoption).

Born Before Arrival

No differences were detected for this variable, indicating correct reporting in 100% of cases by the MNS.

Baby's Birth Date

6 differences were identified, with 4 of these differing by only one digit. The remaining 2 differed significantly by both day and month of birth.

Baby's Birth Time

This was reported differently in 17 cases. Of these, 12 differed by a single digit, with the remaining 5 differing by more than one digit.

Plurality

Correct in both datasets for all 525 cases, indicating correct reporting in 100% of cases by the MNS.

Presentation

There were 9 differences between datasets, indicating a correct recording in 98.7% of cases. In 7 cases, the researcher recorded 'Vertex' presentation, whereas the MNS had recorded 'Breech'. This was due to the unavailability of type of presentation in the medical record.

Method Of Birth

17 differences were detected, indicating correct recording in 96.8% of cases by the MNS. In more than 50% of the differences (9 cases) an emergency caesarean was incorrectly recorded in the MNS when an elective caesarean had occurred. This reiterates the need for clear definitions of terms in the guidelines for completion of the Midwives' Form 2.

Accoucheur(s)

This variable provides five accoucheur types to be reported with the additional option to enter 'Other' type of accoucheur. There were 26 differences identified for this variable. In 19 cases the accoucheur recorded in the MNS was completely different to that recorded by the researcher. During the conduct of the study it was observed that the primary accoucheur was not always clearly indicated. Additionally, this variable allows for more than one accoucheur to be identified on the Midwives' Form 2, however, this information was not available to the researcher unless it was clearly recorded in the medical notes.

Gender

There were 5 false positives detected for gender, indicating correct recording in 99% of cases by the MNS.

Status of Baby at Birth

There were only 2 differences identified for this variable. In both cases, the baby born was correctly identified as stillborn, however the MNS computer package has four categories for this variable (1=liveborn, 2=stillborn (not otherwise specified), 3=anteartum stillbirth, & 4=intrapartum stillbirth) whereas the data collection tool (Midwives' Form 2) has only two categories (1=liveborn, 2=stillborn). In both cases, the researcher recorded the infant as 2=stillborn, however it was recorded as 3=anteartum stillbirth in the MNS. Despite this variation in available categories, the infant was correctly identified as stillborn in both.

Infant Weight

There were 12 differences recorded for infant birthweight. In 8 of these differences, the birthweight differed by only one digit. In 2 cases the recorded weight differed by 2 digits. In the remaining 2 cases, one had no recorded weight as it was not available in the medical notes and the other one had a weight recorded, yet was not recorded by the MNS.

Length

Length was recorded differently in 23 cases. Of these, infant length was not recorded in medical records in 3 cases. The majority of differences (15) were attributable to rounding errors. In all 15 cases, the researcher rounded up to the nearest centimetre (as specified by the guidelines), whereas this figure in the MNS had been rounded down. This reiterates the need for the midwifery education that was conducted during the data collection stage of this study and for greater availability of the guidelines in medical clinical settings.

Head Circumference

Head circumference was recorded differently in 28 cases. In 3 cases, infant head circumference was not recorded in medical records. Again, the majority of differences (21) were attributable to rounding errors. In all 21 cases, the researcher rounded up to the nearest centimetre (as specified by the guidelines), whereas this figure had been rounded down in the MNS.

Time to Establish Unassisted Regular Breathing (TSR)

This was incorrectly recorded in 13 cases. In 6 cases, the TSR differed by one minute between datasets. The TSR was not available in the medical record in 5 cases.

Resuscitation

Method of resuscitation was recorded incorrectly in 29 cases, indicating correct identification 94.5% of the time by the MNS. In the majority of cases (18), resuscitation was not recorded in the medical notes; hence, the researcher recorded no resuscitation as being performed on the infant.

Apgar Score - At 1 Minute

There were 7 differences identified for this variable, with the Apgar score at one minute not being recorded in medical notes in 5 cases.

Apgar Score - At 5 Minutes

There were 10 differences detected for this variable. In 50% of these cases, the Apgar score at five minutes was not available in medical records.

Estimated Gestation

Gestation was recorded differently in 57 cases. Of these, the gestation differed in 50 cases by one week and in each of these the researcher had rounded the gestation up to the nearest week, whereas it was rounded down (correctly) for records in the MNS.

Birth Defects

There were 4 differences recorded in the birth defects category. One was due to a minor spelling mistake.

Birth Trauma

4 differences were identified for the birth trauma category. A chignon was documented as the birth trauma for each of these cases though was not recorded in the MNS.

5.1.7. Baby Separation Details

Table 13: Audit Results - Baby Separation Details

Data Item	Records Correct	Records Incorrect	Data not available in Medical Records	Proportion of Records Correct (%)
Baby Separation Date	489	36	-	93.1
Mode Of Separation	519	6	-	98.9
Special Care Days	517	8	3	98.5

Baby Separation Date

The baby separation date differed in 36 cases. In the majority of these (28 cases), the separation date only differed by one digit, suggesting MNS data entry error. In the remaining 8 cases the separation date was significantly different.

Mode of Separation

The mode of separation was recorded differently in 6 cases, indicating a correct recording by the MNS of 98.9%. In all of the cases where errors were detected, the infant was recorded by the MNS as being transferred to another hospital, whereas the researcher had recorded as discharged home. The transfer details were not available from the medical notes in these cases.

Special Care Days

There were 8 differences recorded for this variable with all differing by more than one day.

6. DISCUSSION

The Health Act 1911 (Section 335) mandates data reporting by midwives for all births they attend in WA. This is facilitated by The Midwives' Notification System (MNS) through the use of a comprehensive notification form and various computer packages. All collected information is stored and maintained on the MNS at the Department Of Health WA. The events of each pregnancy and birth would ideally be reflected in the medical records, the notification forms, notification computer packages and the MNS. However, errors are possible in each stage of data collection, recording and entry. It is inevitable that errors occur due to the magnitude of the MNS. Validation studies, such as this one, are therefore necessary to periodically assess the collected data's accuracy, validity and reliability and also to detect areas for system improvement.

Generally, validation studies are conducted retrospectively utilising medical records. This approach was adopted for this study as it was deemed the most appropriate and feasible method, considering the available time frame and resources. The medical hospital record was considered the most accurate source of data (benchmark) , with data analysis being conducted accordingly. However, it is acknowledged that errors may be present in these records and data may indeed be more accurately recorded in the MNS. This should be considered when interpreting the validation study results.

The selected sample size for this study is another methodological consideration. Whilst 2% may be considered representative of the target population, it may be inadequate for the evaluation of events such as multiple births. Perhaps a bigger sample size or different method of selection may provide more accurate representation and may be justified in future.

In the categories of 'Complications of Pregnancy' and 'Medical Conditions' two coding sets of boxes appear on the Midwives' Form 2. As indicated in the results section, the researcher recorded more information for these categories than the MNS. This may be due to the misconception by midwives that only two conditions are required for entry due to the presence of two sets of coding boxes. In some cases the researcher recorded up to five conditions for these categories. Additionally, the current guidelines in circulation for the completion of the Midwives' Form 2 stipulate that only the two most relevant conditions to the current pregnancy are to be recorded in the 'Other' categories. This information is outdated and does not reflect the current MNS. Those hospitals notifying the MNS via computerised data entry packages are currently able to enter more than two conditions under the 'Other' categories. This reiterates the need for the current guidelines, last published in 1990, to be updated and distributed to each maternity unit and for the MNS data entry tools to be standardised.

This validation study has detected the need for standardised data collection and data entry tools. The current situation allows data to be recorded on a paper form or entered into various computer packages. Each format has minor differences in the available categories for data recording, which permits the same data to be recorded differently in the various formats. To avoid

future errors, the Midwives' Form 2 should perhaps be altered and updated to match the current computer packages, or vice versa. This may not be feasible as some private hospitals have developed different computer packages and may not be willing to alter these. The fiscal implications of this may also be restrictive.

The results of this study are generally encouraging and are similar to the previous validation study conducted in 1994. Particular sections were recorded well, including the pregnancy, labour and baby details sections. However, improvements in certain areas could be made. Whilst not proportionately high, the numbers of false negatives for certain variables are statistically significant. Such variables include Complications Of Pregnancy, Medical Conditions, Type Of Delivery, Anaesthesia, Analgesia and Complications Of Labour and Delivery. The analysed data for these variables suggests the need for complete and accurate recording of all pertinent information in medical records. Findings additionally suggest that clarification of clinical definitions and enhanced familiarity with MNS guidelines is required in the clinical midwifery setting. This could be addressed through further education sessions with midwives and increased access to up to date guidelines.

Rounding errors occurred in three variables, including baby length, head circumference and gestation. For these variables, the researcher rounded up to the nearest whole number, whereas rounding down occurred on the MNS. This reiterates the need for midwifery clinical education and enhanced access to current MNS guidelines.

Another consideration highlighted by this validation study is the number of errors which occurred in recording the attending midwives' name and the lack of availability midwives' registration numbers in medical notes. This could be overcome by standardising the method of recording the midwives' name. Registration number could be recorded in the medical notes on the delivery record to avoid errors in recording this variable in future studies. This could also be overcome by omitting this variable from data analysis in future validation studies.

Feedback gained from midwives working at the hospitals included in this study reinforced the need for greater access to current guidelines to be able to record data as accurately as possible. Midwives from the WA hospitals visited repeatedly mentioned their confusion surrounding terminology and the requirements of the MNS. Further education sessions, regular updates and greater access to current guidelines were suggested as possible strategies to overcome data recording inconsistencies.

7. RECOMMENDATIONS

The main recommendations the researcher presents from the findings of this validation study and from feedback from clinical midwifery staff are as follows:

Perform validation studies on a regular periodic basis, perhaps every five years, to detect errors in the MNS more promptly. The previous validation study was conducted in 1994.

Update the 'Guidelines for Completion Of the Case Attended Midwives' Form 2' regularly to reflect changes made to the MNS. As a direct result of the findings of this study and the clinical feedback received, the researcher has updated these guidelines (September 2006). Multiple copies are to be distributed to each medical hospital by the Maternal and Child Health Unit.

Standardise the MNS data collection tools in order to report homogenous data systematically. This could be achieved by enabling hospitals still utilising the paper Midwives' Form 2 to gain access to the computerised system. As aforementioned, this recommendation may not be feasible or adopted in the private medical sector.

8. REFERENCES

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