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Validation Study of the Western Australian Midwives' Notification System 1986

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SUMMARY

In 1977 a validation study of the Midwives' Notification System was conducted three years after the system was introduced. That study identified a need for major changes to the notification form and recommending if a simple form is filled in well, then it can be used as a trustworthy sampling frame for further in-depth study.[7] This second validation study was carried out by comparing a sample of 312 Notification of Case Attended Forms for 1986 with information contained in the corresponding medical records. Validation was incomplete for many variables due to incomplete documentation in the medical record.

The following variables were found to be more than 90% accurate and can be used with confidence:

- Hospital
- Surname
- Forenames
- Address
- Unit Record Number
- Birthdate (mother)
- Postcode
- Current conjugal state
- Number of previous pregnancies
- Complications of pregnancy:
  Threatened abortion, urinary tract infection, pre-eclampsia, ante-partum haemorrhage - placenta praevia, ante-partum haemorrhage - abruptio, ante-partum haemorrhage - other, premature ruptured membranes, monilia, elevated blood pressure in pregnancy, threatened premature labour, hyperemesis and anaemia
- Type of delivery
- Complications of labour/delivery:
  Fetal distress, prolapsed cord, failure to progress, persistent occipito-posterior, intra/post-partum haemorrhage, elevated blood pressure in labour, previous caesarean section
- Date of discharge
- Type of separation
- Adoption
- Birthdate (baby)
- Birthtime
- Plurality
- Sex
- Condition at birth
- Birthweight
- Apgar

The recording of the following variables was less accurate (80-90%), but still considered to be of an acceptable standard:

. Other miscellaneous complications of labour/delivery
. Separate HA22 for baby
. Special care

The following variable was poorly recorded (64.0%):

. Anaesthesia

Variables for which validation was incomplete on a few occasions but are highly accurate (>90%) and can be used with confidence are:

. Previous children living
. Born alive/now dead
. Stillborn
. Expected due date
. Presentation
. Hours of labour
. Complication of labour/delivery:
  Precipitate delivery, cord tight around neck and cephalo-pelvic disproportion

Onset of labour was not validated on only one occasion but was only 85.3% accurate.

For the following variables there was a significant number of unvalidated cases and should be used cautiously:

. Maiden name
. Race
. Height
. Date of LMP
. Certain/not certain
. Other miscellaneous complications of pregnancy
. Medical conditions
. Neonatal blood screening
. Length
. Time to spontaneous respiration
. Resuscitation
. Congenital anomalies
. Birth trauma

Estimated gestation was unable to be validated on a significant number of occasions and was poorly recorded.

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TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

The Midwives' Notification System was established in Western Australia in 1974 with the introduction of a triplicate Notification of Case Attended Form 2 (Appendix A) which is completed by the attending midwife. Completion of this form is a statutory requirement under the Health Act (Section 335) and Midwifery Nurses' Regulations. The form is completed for every birth equal to or greater than 400 grams birthweight, equal to or greater than 20 weeks gestation, or for any livebirth outside these criteria. The white copy of the Form 2 is forwarded to the Health Department within 48 hours of birth and provides an early notification to child health and community health nurses. The green copy is forwarded together with the hospital admission summary HA22 form (Appendix B) on discharge and provides the information for the Midwives' Notification System. A blue copy is retained in the patient's medical record as a brief summary of the confinement. "Guidelines for the Completion of the Notification of Case Attended Form 2" were published in 1985 and are available to midwives as a reference when filling in the form.[1]

The Maternal and Child Health Studies Unit in the Epidemiology Branch of the Health Department co-ordinates the input and output of the Midwives' Notification System. Output includes two annual reports: "Perinatal Statistics in Western Australia" has been produced annually since 1983 and the "Western Australian Birth Cohort (Perinatal and Infant Mortality Identified by Maternal Race)" was first compiled in 1984.[2,3,4,5,6] Much of the remaining output is for the purpose of assisting with ongoing research in obstetrics, maternal and infant health and processing an increasing number of requests related to planning obstetric and neonatal services.

The first validation study of the Midwives' Notification System was conducted in 1977, by MacDonald and Stanley,[7] three years after the introduction of the triplicate form. In view of the increased demand for data from the system and its importance as a research and planning tool, it is imperative that users know how much confidence they can place in it. Thus, there was a need for this second validation study.

METHOD

The research method used was similar to that used in the 1986 "Validation Study of the Victorian Perinatal Data Collection Forms".[8]

SAMPLE

A sample of 312 (1.3% of total) births in 1986 was selected from all 15 metropolitan maternity hospitals (10 government and 5 private) and 13 country hospitals (12 government and 1 private). Selection of country hospitals was influenced by cost factors and thus their proximity to Perth. Ninety-nine percent of births occurred in 76 hospitals throughout Western Australia and 83% in the participating hospitals.

Seventy seven percent (243) of the sample was from the metropolitan area and 23% (69) was from the country which approximately reflected the actual percentage distribution of place of birth. Included in the metropolitan sample were 4 homebirths.

A sample size of 300 was chosen on the basis of a power calculation. The cost of taking a larger sample did not warrant the small further increase in statistical power.

To select a sample of around 300 the total number of births in the participating hospitals in 1986 was multiplied by the percent distribution required for metropolitan, country and homebirths to give the sampling fraction for each. Computerised random numbers were then used to select cases from a list of births sorted by hospital.

PROCEDURE

Approval was obtained from the Chairman of the Confidentiality of Health Statistics Committee and from all hospitals prior to commencement of the study. All hospitals indicated their willingness to allow access to medical records.

A blank Notification of Case Attended Form 2 marked 'Validation' was completed for each birth using information recorded in the medical record. The validation form was then checked against the blue medical record copy of the Notification Form 2 and any discrepancies were double checked in the medical record. Validation forms were later checked against the green Health Statistics copy of the Notification Form 2 which had undergone all editing procedures within the Maternal and Child Health Studies Unit.

Thus, this study undertook a comparison between the information recorded on the Notification of Case Attended Form and the information contained in the medical record. Where information was not available in the medical record, validation was incomplete. Data were collected and analysed by one observer.

At all hospitals visited, an inservice session with midwives was held to provide feedback on their own hospital data compared with the State figures and to inform them of the uses of the Midwives' Notification System and its contribution to the improvement of maternal and child health. Thus, the importance of its accuracy was stressed. Useful discussions resulted in definitional misunderstandings being clarified and methods determined to improve accuracy, thereby reducing the need for follow-ups.

ANALYSIS

For the purpose of analysis, information on the forms was classified into 67 variables. The 12 most common complications of pregnancy were analysed individually and conditions occurring once or occasionally twice were combined into a category named 'Other miscellaneous complications of pregnancy'. Medical conditions were not analysed individually owing to the low prevalence of a wide variety of diseases. Complications of labour and delivery were categorised similarly to complications of pregnancy with 10 variables for the more common problems, and one for 'Other miscellaneous complications of labour/delivery'.

Analysis of dichotomous variables (i.e., variables having only two possible values such as absent/present) involved collating the information on the notification form into true positives and negatives, and false positives and negatives.

The sensitivity and specificity of each validated dichotomous variable was then calculated using the following formula:
Sensitivity = true positives/total occurrences
Specificity = true negatives/total non-occurrences
Sensitivity is the proportion of true occurrences which are correctly identified as positives; and specificity is the proportion of true non-occurrences which are correctly identified as negatives.

Percentage correct was calculated thus:
Total number correct (true positives + true negatives) divided by the total number in the sample multiplied by 100.

Polychotomous variables (i.e., those having more than two possible values) were analysed by calculating the number correct, number incorrect and percentage correct.

Where information was recorded on the notification form and not in the medical record it was identified as unvalidated and the percentage correct was calculated for the validated numbers only. Sensitivity and specificity was not calculated for polychotomous or unvalidated variables.

RESULTS

Of the 312 births selected, 4 were excluded from the study due to the unavailability of medical records.

Table 1 gives a profile of the sample to demonstrate its representativeness.

TABLE 1

SAMPLE PROFILE

	PERCENT DISTRIBUTION	
	SAMPLE	WESTERN AUSTRALIA 1986
ONSET OF LABOUR:		
Spontaneous	37.0	45.4
Spontaneous and Augmented	27.3	18.0
Induced	25.3	27.0
No labour	10.4	9.7
TYPE OF DELIVERY:		
Normal	62.0	62.8
Vacuum	9.1	8.4
Forceps	10.4	11.3
Elective Caesarean	6.2	7.9
Emergency Caesarean	11.4	7.9
Breech	1.0	1.5
SEX:		
Male	53.0	51.7
Female	46.4	48.3
Indeterminate	0.3	0.0
PLURALITY:		
Singleton	98.0	97.7
Multiple	2.0	2.3
CONDITION AT BIRTH:		
Liveborn	98.7	99.2
Stillborn	1.3	0.8

EVALUATION OF VALIDATED POLYCHOTOMOUS VARIABLES

Table 2 includes validated, continuous variables related to demographic information, the number of previous pregnancies, the current labour/delivery separation details and baby characteristics.

Sixteen of the 17 variables in this table were more than 95% accurate.

Anaesthesia

Anaesthesia was reported correctly on 197 occasions (111 incorrect) which resulted in an accuracy percentage of only 64%. This was the least accurate variable of all in this validation study. Errors included incomplete recordings; e.g., not all types of analgesics or anaesthetics were itemised where a combination had been used.

Date of Discharge and Type of Separation

Date of discharge and type of separation were very accurate, but it was surprising to note the number of times information was reported incorrectly for these variables.

Date of discharge was recorded incorrectly on 10 notification forms; some of these were related to the 12 incorrectly recorded types of separation. Some midwives were not aware that the first separation of the baby was the one required; e.g. transfer to another hospital.

Birthdate and Birthtime

Birthdate (99.7%) and birthtime (96.1%) variables were accurate but one birthdate was recorded incorrectly and birthtime was transcribed incorrectly on 12 forms.

TABLE 2

EVALUATION OF VALIDATED POLYCHOTOMOUS VARIABLES

VARIABLE	NUMBER CORRECT	NUMBER INCORRECT	PERCENTAGE CORRECT (n = 308)
Hospital	308	0	100.0
Surname	306	2	99.4
Forenames	300	8	97.4
Address	307	1	99.4
Unit Record Number	300	8	97.1
Birthdate (mother)	307	1	99.4
Postcode	308	0	100.0
Current conjugal state	303	5	98.4
Previous pregnancies	294	14	95.5
Type of delivery	296	12	96.1
Anaesthesia	197	111	64.0
Date of discharge	298	10	96.5
Type of separation	296	12	95.8
Birthdate	307	1	99.7
Birthtime	296	12	96.1
Birthweight	308	0	100.0
Apgar	303	5	98.4

EVALUATION OF VALIDATED DICHOTOMOUS VARIABLES

Table 3 includes validated dichotomous variables related to complication of pregnancy, complications of labour/delivery and baby characteristics. Twenty three of the 26 variables in this table were more than 90% accurate.

Complications of Pregnancy

Complications of pregnancy in Table 3 were well reported. In fact the only variable in this group which was less than 95% accurate was premature ruptured membranes and this was due to a confusion between the definition of premature and preterm ruptured membranes. Premature ruptured membranes were not reported in 27 pregnancies although there was evidence in the medical record that membranes were ruptured prior to the onset of labour.

All complications of pregnancy were highly specific. The complications of urinary tract infecion, pre-eclampsia and hyperemesis had a sensitivity greater than 0.5 while all other complications of pregnancy in Table 2 had a low sensitivity. The low sensitivity scores were attributed to the number of times complications were not recorded on the notification form but were present in the medical record (false negatives).

Complication of labour/delivery

All of the 8 specified complications of labour/delivery were more than 90% accurate. Specificity for these 8 variables was 1.0. Sensitivity was greater than 0.5 for all specified complications of labour/delivery except intra/post partum haemorrhage and elevated blood pressure in labour.

Similar to complications of pregnancy, sensitivity was affected by the number of times complications existed but were not reported by midwives (false negatives).

Grouped together in the variable "Other miscellaneous complications of labour/delivery" were sundry complications of low prevalence. The overall accuracy of this group was 85.7% and was influenced by the large number (41) of false negatives.

Listed below are some of the 'Other miscellaneous complications of labour/delivery' which did exist but were not reported:

. Intrapartum haemorrhage
. Delayed second stage - 3 hours (reason for intervention)
. Shoulder dystocia
. Oligohydramnios
. Insulin dependent diabetic (reason for intervention)
. Aortic incompetence treated with diuretics and antibiotics in labour
. Post-maturity (reason for intervention)
. Premature onset
. Polyhydramnios
. Trial of scar
. Prolonged ruptured membranes
. Post-epidural headache
. Retained placenta
. Psychotic episode - drug induced
. High head at term - primigravid
. True knot in cord

Special Care and Separate HA22 for Baby

These 2 variables rated 80.2% and 83.4% accuracy respectively. Both had low sensitivity and high specificity.

The definition of special care was not clear and therefore a wide range of interpretations was used. Information supplied was relatively consistent within each hospital but varied widely between hospitals.

Conditions which were considered to be indicative of special care by the researcher and yet not recorded as such on the notification forms are listed below:

. Jaundice requiring phototherapy
. Hyaline membrane disease
. Hypoglycaemia
. Pyrexia/septic screening/antibiotic therapy
. Prematurity
. Apnoea
. Aspiration
. Respiratory distress syndrome
. Baby for adoption
. Feeding problems
. Infant of diabetic mother
. Cyanosis
. Staphylococcus aureus infection
. ABO incompatibility

TABLE 3

EVALUATION OF VALIDATED DICHOTOMOUS VARIABLES

	TRUE POSITIVE a	TRUE NEGATIVE d	FALSE POSITIVE b	FALSE NEGATIVE c	SENSITIVITY	SPECIFICITY	PERCENTAGE CORRECT (n = 308)
COMPLICATIONS OF PREGNANCY:							
Threatened abortion	6	292	0	10	0.38	1.0	96.8
Urinary tract infection	13	287	3	5	0.72	0.99	97.4
Pre-eclampsia	31	271	3	3	0.91	0.99	98.1
APH-placenta	1	306	0	1	0.50	1.0	99.7
- abruptio	0	308	0	0	0.0	1.0	100.0
- other	4	298	0	6	0.40	1.0	98.1
Premature ruptured membranes	12	268	1	27	0.31	1.0	90.9
Monilia	3	291	0	14	0.18	1.0	95.5
Elevated BP in pregnancy	4	296	0	8	0.33	1.0	97.4
Threatened premature labour	5	298	0	5	0.50	1.0	98.4
Hyperemesis	4	300	1	3	0.57	1.0	98.7
Anaemia	2	297	0	9	0.18	1.0	97.1
COMPLICATIONS OF LABOUR/DELIVERY:							
Fetal distress	41	249	0	18	0.69	1.0	94.2
Prolapsed cord	2	306	0	0	1.0	1.0	100.0
Failure to progress	11	292	0	5	0.69	1.0	98.4
Persistent occipito-posterior	6	297	0	5	0.55	1.0	98.4
Intra/post partum haemorrhage	5	293	0	10	0.33	1.0	96.8
Elevated BP in labour	3	280	0	25	0.11	1.0	91.9
Previous caesarean section	15	286	0	7	0.68	1.0	97.7
Other miscellaneous complications of labour/delivery	45	219	3	41	0.52	0.99	85.7
Special care	17	230	16	45	0.27	0.93	80.2
Separate HA22 for baby	12	245	6	45	0.21	0.98	83.4
Adoption	307	0	1	0	1.0	-	99.7
Plurality	308	0	0	0	1.0	-	100.0
Sex	308	0	0	0	1.0	-	100.0
Condition at birth	308	0	0	0	1.0	-	99.7

Adoption	307	0	1	0	-	1.0	1.0	99.7
Plurality	308	0	0	0	-	1.0	1.0	100.0
Sex	308	0	0	0	-	1.0	1.0	100.0
Condition at birth	308	0	0	0	-	1.0	1.0	99.7

EVALUATION OF UNVALIDATED POLYCHOTOMOUS VARIABLES

Table 4 lists the continuous variables for which validation was incomplete due to the number of times they were missing from the medical record. The percentage correct for variables on this Table was calculated using only the validated numbers and should therefore be used with caution.

For previous children living, born alive/now dead, stillborn, expected due date, onset of labour, presentation and hours of labour the information was missing on 5 or less occasions, so the percentage correct for practical purposes is accurate.

Onset of Labour

The percentage correct for this variable was 85.3%. This lower accuracy was not due to unvalidated cases as there was only one, but it is related to the large number (45) of times it was recorded incorrectly. It was generally not understood that artificial stimulation of contractions following spontaneous premature ruptured membranes is an induction and not an augmentation. This false recording occurred on 11 notification forms. More commonly, augmentation was simply not recorded on the notification form (34).

For the remainder of the variables in Table 4 the information was not documented in the medical record on a significant number of occasions.

Maiden Name

On 103 occasions maiden name was recorded on the notification form but not in the medical record. Excluding these unvalidated numbers the percentage correct was 99.5%. On one occasion the maiden name was spelt incorrectly.

Race

Similarly, race was difficult to validate satisfactorily because it was not found in the medical record on 35 occasions.

Percentage accurate for the validated forms was 99.6%. On several occasions women born in Middle East or European countries were classified as 'other' instead of caucasian. Where the country was specified, however, the correction was able to be made by coders.

Height

Excluding the 18 unvalidated cases, height was calculated to be 94.8% accurate. Differences in height measurement varied from 1cm to 8cm on 15 notification forms.

Date of LMP (Last menstrual period)

On 8 occasions the Date of LMP was transcribed incorrectly. With the 32 unvalidated numbers excluded from calculation the percentage correct was 97.1%.

Length

Babies length was recorded correctly for 98.6% of cases after exclusion of the 16 unvalidated cases.

For the 4 incorrect recordings the difference in length recorded on the notification form to that in the medical record varied from 1cm to 6cm.

Time to Spontaneous Respirations and Resuscitation

These two variables and the well reported variable, Apgar, are used by researchers in the fields of cerebral palsy and mental retardation. The validity of these variables, therefore, is of utmost importance and was not helped by the alarming lack of documentation in the medical record related to the first minutes of life. Time to spontaneous respiration was not recorded in 73 medical records (23.7% of the sample) and resuscitation was not specified in 59 medical records (19.2% of the sample).

The percentage correct of the remaining notification forms was over 90%, but this cannot be used with any degree of confidence.

Time to spontaneous respiration was recorded incorrectly on 18 notification forms and the differences reported ranged from 1 minute to 6 minutes.

Resuscitation recorded on the notification form was more active than that recorded in the medical record on 12 occasions and less active on 4 occasions. The latter discrepancy casted doubt on the accuracy of the medical record in these instances as there were other factors such as low apgars which indicatd active resuscitation was likely.

Estimated Gestation

Estimated gestation scored a less than desirable percentage correct of 79.4% after correcting for the very large number (85) of cases which were unable to be validated. Antenatal estimation of gestation was always recorded but in the unvalidated cases there was no record of whether or not the clinical estimation of gestation of the baby after birth concurred with dates. In another 46 medical records there was written evidence that the clinical gestation of the baby was different to that recorded on the notification form. Differences ranged from 1 week to 4 weeks.

Despite the many uses of this variable to researchers it cannot be used with any degree of confidence based on the findings of this study.

TABLE 4

EVALUATION OF UNVALIDATED POLYCHOTOMOUS VARIABLES

	NUMBER CORRECT	NUMBER INCORRECT	NOT VALIDATED	PERCENTAGE CORRECT*
Previous children living	306	1	1	99.4
Born alive/now dead	307	0	1	100.0
Stillborn	307	0	1	100.0
Expected due date	303	4	1	98.7
Onset of labour	262	45	1	85.3
Presentation	302	1	5	99.7
Hours of labour	284	22	2	92.8
Maiden name	204	1	103	99.5
Race	272	1	35	99.6
Height	275	15	18	94.8
Date of LMP	268	8	32	97.1
Length	288	4	16	98.6
Time spontaneous respirations	217	18	73	92.3
Resuscitation	233	16	59	93.6
Estimated gestation	177	46	85	79.4

* Does not include unvalidated numbers

EVALUATION OF UNVALIDATED DICHOTOMOUS VARIABLES

Table 5 includes true positives and negatives, false positives and negatives, the number of cases unable to be validated and the percentage correct excluding the unvalidated cases. Owing to the lack of validated cases, sensitivity and specificity has not been calculated.

Percentage correct for the three complications of labour/delivery in this table was accurate and can be used confidently because the number of unvalidated cases was 5 or less.

The remainder of the variables on Table 5 cannot be used with confidence owing to the large number of unvalidated cases.

Certain/Not Certain

This variable refers to the date of last menstrual period and was 95.8% accurate after the 94 unvalidated cases were excluded. On 9 occasions the answer given on the notification form was opposite to the findings in the medical record.

Other Miscellaneous Complications of Pregnancy

This variable included a wide range of complications which prevailed once or twice in the sample. Complications present were recorded correctly on 16 notification forms. Absence of complications was correctly identified on 237 forms. On 1 occasion a complication was recorded on the notification form and yet there was clear evidence in the medical record that the complication was not present.

The number (37) and seriousness of unreported complications (false negatives) is worrying.

Examples of these are listed below:

- Oligohydramnios/positive contraction stress test
- Acute urinary retention associated with retroverted impacted uterus
- Unclassified hypertension/polyhydramnios
- Abdominal pain requiring admission
- Acute haemorrhoids
- Amniocentesis
- Glycosuria

- Unstable lie
- Carpel tunnel syndrome
- Cervical incompetence
- Aspiration pneumonia/respiratory failure/pulmonary oedema
- Gardnerella vaginal infection
- Gastroenteritis
- Herpes (dormant)
- Pruritus/jaundice
- Impacted retroverted incarcerated uterus/fibroids
- Non-reactive cardiotocograph
- Acute severe oedema
- Falling oestriols (reason for elective caesarean being converted to an emergency)
- Prolonged ruptured membranes

Percentage of 'other miscellaneous complications of pregnancy' correct was 86.9% excluding the 17 unvalidated cases.

Medical Conditions

Once again the concern is the number (28) of notification forms where serious conditions were omitted. Examples of these are listed below:

- Asthma
- Drug addiction
- Rheumatic fever (past history)
- Cardiac murmurs
- Herpes zoster
- Hypothyroidism
- Genital warts
- Laryngeal stenosis/sub glottal stridor
- Diabetes/retinopathy
- Organic brain dysfunction
- Chorea
- Depression
- Gross obesity
- Hypertension/with and without renal involvement
- Endometriosis
- Migraines
- Chronic bronchitis

Omitting the 19 unvalidated medical conditions this variable was 90.3% accurate.

Neonatal Blood Screening

After correcting for the 40 unvalidated cases neonatal blood screening was 91.0% correct.

On seven notification forms the section was ticked indicating that the Guthrie test had not been done at the time of the baby's discharge from hospital when in fact there was evidence in the medical record that it had been. On 17 occasions the Guthrie test had not been done in hospital and yet this was not indicated in the tick box on the notification form. It was apparent from these discrepancies and from discussions with midwives that the purpose of this section on the notification form was not always understood.

It was suspected that the level of accuracy could have been partially attributed to the number of true negatives which occurred by default.

Congenital Anomalies

On 265 notification forms congenital anomalies were correctly identified as being present (5) or absent (260).

On 12 occasions congenital anomalies were noted during the babies stay in hospital, but were not recorded on the notification form and these are listed below:

- Large birth marks face and back
- Cardiac murmurs still present on discharge
- Lump, left mandibular tissue
- Rib and vertebral anomalies
- Possible Trisomy 20/hypotelorism/flat nasal bridge
- Ventricular - septal defect
- Plagiocephaly
- Possible Von Willebrands disease
- Micro-colon
- Abnormal 5th toes
- Torsion of testis

Whilst some of these conditions would not have been noted at birth they were all noted or suspected prior to discharge from hospital and should have been recorded on the green Health Statistics copy of the notification form.

The percentage correct for this variable was 95.7% but was distorted because of the exclusion of 31 unvalidated cases.

Birth Trauma

Once again, the accuracy (96.0%) was influenced by the omission of the number (30) of unvalidated cases. The following list includes birth traumas which were recorded in the medical record but were omitted from 11 notification forms:

. Chignon
. Cephelhaematoma
. Bilateral cephalhaematoma
. Facial palsy
. Brachial plexus palsy
. Scalpel wounds

TABLE 5

EVALUATION OF UNVALIDATED DICHOTOMOUS VARIABLES

	TRUE POSITIVE	TRUE NEGATIVE	FALSE POSITIVE	FALSE NEGATIVE	NOT VALIDATED	PERCENTAGE CORRECT*
COMPLICATION OF LABOUR/DELIVERY:						
- Precipitate delivery	2	303	0	0	3	100.0
- Cord tight around neck	20	278	0	5	5	98.3
- Cephalo-pelvic disproportion	10	295	0	0	3	100.0
Certain/not certain	205	0	9	0	94	95.8
Other miscellaneous complications of pregnancy	16	237	1	37	17	86.9
Medical conditions	21	240	0	28	19	90.3
Neonatal blood screening	16	228	7	17	40	91.0
Congenital anomalies	5	260	0	12	31	95.7
Birth trauma	16	251	0	11	30	96.0

DISCUSSION

This validation study of the Midwives' Notification System was conducted to assess the accuracy of the information provided on Notification of Case Attended Forms by the midwives of Western Australia.

The sample included 1986 births occurring in metropolitan and country hospitals and at home.

Validation was performed by comparing fully edited notification forms against information contained in the medical record.

For the purposes of analysis the information was categorised into 67 variables.

Of the 67 variables defined, 43 were able to be validated on every notification form in the sample. Of the validated variables, 39 were found to be over 90% accurate. The other 4 validated variables were anaesthesia (64.0%), other miscellaneous complications of labour/delivery (85.7%), special care (80.2%) and separate HA22 for baby (83.4%).

Twenty four variables were unable to be validated for every notification form owing to a lack of documentation in the medical records.

Of these 24 variables, 10 had unvalidated cases on five or less occasions and so for practical purposes these were considered to have been validated satisfactorily. Percentage correct was calculated after excluding the unvalidated cases and nine of the 10 variables were greater than 90% accurate.
Onset of labour was 85.3% accurate and this was due to definitional confusion related to premature ruptured membranes and the number of times augmentations were omitted.

The remaining 14 variables had unvalidated cases on not less than 16 and not greater than 103 occasions. Percentage correct for 12 of these variables (excluding unvalidated cases) was greater than 90%.

Other miscellaneous complications of pregnancy (86.9%) were influenced by the number of times an existing complication was not reported on the notification form.

Estimated gestation was one of the least accurate variables in the study. After correcting for the large number of unvalidated cases the percentage correct was only 79.4%. This poor result was directly attributed to the very large number of discrepancies between the notification form and the medical record (false positives).

Congenital anomalies reported on notification forms are forwarded to the Congenital Malformations Register for verification and computer entry prior to linkage with the Midwives' Notification System. Malformations discovered during the baby's stay in hospital should be added to the green Health Statistics copy of the notification form as well as being documented on the orange congenital malformations notification card. It is generally believed by data collection units that it is better to err on the side of over-reporting than under-reporting, especially for congenital malformations, complications of pregnancy/labour/delivery and medical conditions.

Anaesthesia was poorly recorded (64.0%) because of the obvious confusion over what is required and this is not clearly explained on the notification form.

There was an appreciable number of other miscellaneous complications of labour/delivery which were existing but unreported.

The definition of special care is ambiguous and open to misinterpretation. Conflicting information related to the use of neonatal morbidity data also leads to different levels of compliance.

Although the 1977 validation study used different analytical methods to this current study it is of interest to compare some of the results.

Hours of labour and apgars were reported more accurately in 1986. Reporting of the more common complications of pregnancy/labour/delivery has improved also since 1977.

Estimated gestation was reasonably well reported in 1977 and is poorly reported in 1986. Maternal height and baby's length were reported well in the former study, but were unable to be validated in some cases in 1986.

Congenital anomalies and birth trauma were poorly reported in 1977 and were unable to be validated in a significant number of cases in the current study.

Race, date of LMP and time to spontaneous respirations were found to be reasonably well reported in the first study, but were unable to be validated satisfactorily in this study.

Variables which were similarly well reported in both studies were maternal birthdate, conjugal state, presentation, date of birth, sex, birthweight and plurality.

Following the 1977 validation study, major changes were made to the Notification of Case Attended Form including a more logical sequence, specifying complications and providing tick boxes, and clarification of details relating to previous pregnancies. Information pertaining to these variables has thus improved, but further refinements of the form are necessary.

RECOMMENDATIONS

Several problem areas have been identified during this validation study which lead to the following recommendations being made.

1. **Refinements to the Notification of Case Attended Form 2 -**

   a) Further specification of complications, conditions, abnormalities and traumas should be made to act as a reminder to midwives of the type of information that is required.

   b) Onset of labour may achieve more accurate responses if the following choices are listed:
   . Spontaneous
   . Spontaneous and augmented
   . Induced
   . No labour

   c) Anaesthesia should be entitled Anaesthesia/Analgesia and more clarification on the form should be given as to what is required in the section entitled "Other".

   d) Resuscitation - suction should not be classified as no resuscitation. There should either be a separate tick box choice or a covering explanation that it is excluded.
   e.g.
   . Suction
   . O_2
   . Bag and mask
   . Intubation
   . Other

   e) Hours of labour - some clarification of requirements is necessary.

   f) Neonatal blood screening - this may be better understood if it was to read:
   Guthrie done prior to separation No ( )

Many of the above suggestions have already been included in a conglomerate form (Appendix C) recommended for discussion in a recent review of the Midwifery Regulations.[9] This study reinforces the need for further action to improve the form.

2. **Review of the Guidelines for Completion of the Notification of Case Attended Form 2.**
Definitions requiring clarification include:

a) Current conjugal state - explaining that if the woman is living at the same address as her male partner, for the purposes of the form she should be classified de facto.

b) Race - more examples should be given to exclude misclassification of women from the Middle East and European countries.

c) Other complications of pregnancy - more examples may assist the midwives.

d) Medical conditions - more examples here may also improve ascertainment.

e) Hours of labour - A more exact definition is required in order to encourage more uniform recording.
E.g., from the start of 5 minutely contractions to the delivery of the babe, to the nearest hour. If labour was established for less than 1 hour, record 01.

f) Special care - a clear definition of what type of special care is to be recorded must be outlined in the guidelines. Currently the guidelines state that an HA22 should be completed for any baby requiring more than routine normal care. The guidelines go on to define special care as meaning level 2 and/or level 3 nursery care. It is recommended by the researcher that the latter definition be excluded from the guidelines because it is restrictive.
If only these babies are included, neonatal morbidity in Western Australia will be under-reported as many babies requiring, for example, oxygen or phototherapy are nursed outside the hospitals listed as providing level 2 and level 3 care.
A document defining levels of neonatal care is currently being developed by the National Health and Medical Research Council and should provide some clarification in this matter. Until this definition is agreed upon, and the purposes of the information are communicated to the midwives, data related to neonatal morbidity in Western Australia will continue to be sporadic and of little use.

g) Time to spontaneous respiration - an attempt has already been made to improve ascertainment by altering the words on the Notification Form to 'Time to establish unassisted regular breathing (mins)' and obviously this will be followed up by a clearer statement in the guidelines. If respirations are established within 1 hour then the number of minutes should be recorded. Ventilation beyond 1 hour should be recorded as 98.

3. **Documentation in Medical Record -**

As mentioned in the results, many variables were not able to be verified satisfactorily against the medical record. These were discussed at each hospital feedback session and all midwives were keen to share ideas to improve their documentation. Some of their suggestions are included here for the benefit of all midwives:

a) Maiden name - In some hospitals this detail is noted in brackets following the surname on the HA22 admission summary. This is done by clerical staff on admission and is used by them to link medical records of the patient prior to her name change. Alternatively many hospitals have maiden name included on their pre-admission interview form.

b) Pre-admission interview form - the layout of these forms varied between hospitals but the same principles were followed. This interview gave the midwives an opportunity to gain knowledge of the woman's health status up to the time of interview. Included on this form were details of the unvalidated variables: maiden name, race, height, date of LMP, certain/not certain, and expected due date and medical conditions.

c) Antenatal booking slip - this idea is an extension of the pre-admission interview form and its implementation would be welcomed by midwives as their knowledge of the antenatal period was often non-existent if they had not been involved in the woman's care. Introduction of an antenatal booking slip has already been recommended by the recent Committee to Review Midwifery Regulations, and earlier in 1980 by Stanley, Bedford and Hartfield.[10] Its introduction would undoubtedly reduce the number of false negatives for complications of pregnancy and medical conditions.

d) Neonatal summary - several very good neonatal summaries were in use in the hospitals visited and where this was so, documentation of the first minutes of life was generally done well. In some hospitals however, there was no record whatsoever of the time to spontaneous respirations, resuscitation or any estimation of gestation of the baby after birth. In these hospitals there was usually no evidence that the baby had been checked for abnormalities or trauma. Samples of neonatal summaries were shown to and welcomed by staff of hospitals where they were not in use. Further examples of documents referred to in these recommendations are available from the researcher.

Positive feedback was always given to hospitals whose records were excellent.

4. **Clinical Estimation of Gestation -**

In view of the potential usefulness of this variable to child health researchers and the fact that it rated the poorest in terms of accuracy, it is recommended that midwives should take responsibility for performing and recording clinical tests for gestation. Not all babies are seen by a paediatrician and so the responsibility for recording this vital detail is disseminated and inevitably it gets forgotten. Either the Dubowitz or Ballard scoring systems are recommended. It would be preferable if the same system was used throughout all hospitals and schools of midwifery. Implementation of a scoring system would need to be done in consultation with representatives from schools of midwifery, The Australian College of Midwives (WA Branch) and practicing midwives.

5. **Education for Midwives -**

There is an obvious need for ongoing education for midwives as to the uses of the data and their importance in relation to improving outcomes for mothers and babies. There are time and money constraints on inservice education but the need nevertheless exists. A visit by the Co-ordinator of the Maternal and Child Health Studies Unit to all Schools of Midwifery, preferably toward the end of their post-graduate year may assist in improved data collection.

A video tape would be an alternative cheaper teaching strategy.

6. Follow ups for Missing, Conflicting or Incomplete Data -

Follow ups should continue as the information gained contributes greatly to the overall accuracy of the Midwives' Notification System. This feedback to the midwives provides an avenue of learning for them. With the introduction of computerisation into maternity units, inbuilt editing systems will of course reduce follow up queries to a minimum.

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APPENDIX A

Health Act (Midwifery Nurses) Regulations Form 2

NOTIFICATION OF CASE ATTENDED

1 Hospital .....

PARTICULARS RELATING TO MOTHER

PRINT IN BLOCK LETTERS

2 SURNAME

6 UNIT RECORD No.

3 FORENAMES

7 BIRTH DATE

4 ADDRESS OF USUAL RESIDENCE

8 POSTCODE

5 MAIDEN NAME

9 Current Conjugal State
- *single* ( )
- *married (incl. de facto)* ( )
- *other* .....

10 Race
- *Caucasian* ( )
- *Aboriginal (full or part)* ( )
- *Other* ..... ( )

11 Height *(cms)*

PREGNANCY

PREVIOUS PREGNANCIES *(excluding this pregnancy)*

Total number of

12 Previous Pregnancies

13 Previous children now living

14 born alive, now dead

15 stillborn

THIS PREGNANCY

16 Date of LMP

17 This date · certain ( ) 1
not certain ( ) 2

18 Expected due date

19 Complications of Pregnancy:
- *Threatened abortion (under 20 weeks)* [ ] A
- *urinary tract infection* [ ] B
- *pre eclampsia* [ ] C
- *APH – placenta praevia* [ ] D
- *– abruptio* [ ] E
- *– other* [ ] F
- *prem. rupture of membranes* [ ] G

20 *other* ..... H

21 Medical Conditions:

LABOUR AND DELIVERY

23 Onset of Labour:
- *spontaneous* [ ] A
- *induced* [ ] B
- *no labour* [ ] D

24 Presentation:
- *vertex* ( ) 1
- *breech* ( ) 2
- *other* ( ) 3

25 Type of Delivery:
- *normal* [ ] A
- *vacuum — successful* [ ] B
- *— failed* [ ] C
- *forceps — successful* [ ] D
- *— failed* [ ] E
- *breech manoeuvre* [ ] F
- *caesarean — elective* [ ] G
- *— emergency* [ ] H

Anaesthesia:
- *none* [ ]
- *general* [ ] A
- *epidural/spinal* [ ] B
- *other* [ ] C

26 Hours of established labour:

27 Complications of Labour, Delivery:
(Include reason for Caesarean)
- *precipitate delivery* [ ] A
- *foetal distress* [ ] B
- *prolapsed cord* [ ] C
- *cord tight around neck* [ ] D
- *cephalopelvic disproportion* [ ] E

28 *other* ..... F

BABY

Separate Form for each Baby

Adoption Yes ( ) No ( )

33 Birth Date:

34 Time (24 hr. clock)

35 Plurality:
- *single birth* ( )
- *first twin* ( )
- *second twin* ( )
- *other multiple birth:* ( )

36 *(specify baby number__of__)*

37 Sex: *male* ( )
female ( )

38 Condition: *liveborn* ( )
stillborn ( )

39 Birthweight *(grams)*

40 Length *(cms)*

41 Time to establish unassisted regular breathing (mins)

42 Resuscitation:
- *none* [ ]
- *intubation* [ ]
- *oxygen only* [ ]
- *other* .....

43 Apgar Score *(5 mins)*

Estimated Gestation *(weeks)*

44 Congenital Anomalies .....

45 Birth Trauma *(Eg.cephalhaematoma)*

BABY'S SEPARATION DETAILS

Date of Discharge
29 Transfer or Death

Neonatal Blood Screening No ( )

30 Type of Separation:
- *Discharged home* ( ) 1
- *Died* ( ) 2
- *Transferred to* ( ) 3

.....

31 Special Care (wholedays only)

32 Separate HA22 for baby:
- *yes, attached* ( ) 2

COMPLETE SECTION ON SEPARATION

Attach to Mother and Baby's Inpatient Summaries (HA22). Forward to Health Statistics P.O. Box 8172 Stirling Street, PERTH 6001 after discharge of Mother and/or baby whichever is later.

MIDWIFE

Name .....

Signature .....

22 Reg. No. ..... Date ...../...../.....

55097/6/87—30M SETS—S/7002

HEALTH STATISTICS COPY

W.M.F. HK 5

HEALTH ACT (MIDWIVES REGULATIONS) FORM 2
NOTIFICATION OF CASE ATTENDED
PARTICULARS RELATING TO MOTHER

1. PLACE OF BIRTH HOSPITAL ..... BBA ( ) HOME( )

6 UNIT RECORD NO.

2. SURNAME

7 BIRTHDATE

3. FORENAMES

4. ADDRESS OF USUAL RESIDENCE

8 POSTCODE

5. MAIDEN NAME

HOME TELEPHONE NO.

9. MOTHERS OCCUPATION AROUND THE TIME OF CONCEPTION .....

10. CURRENT CONJUGAL STATE:
- Single ( ) 1
- Married ( ) 2
- Other ( ) 3
- Defacto ( ) 4

11. RACE:
- Caucasian ( ) 1
- Aboriginal (full or part) ( ) 2
- Asian ( ) 3
- Other (specify)..... ( ) 4

12. CIGARETTE SMOKING DURING PREGNANCY:
Average consumption (for each trimester tick appropriate box)

	First 3 Months	Second 3 Months	Third 3 Months
Nil	1	5	9
< 10 cigarettes per day	2	6	10
10-20 cigarettes per day	3	7	11
> 20 cigarettes per day	4	8	12
Mother declined to answer	13		

13. ALCOHOL CONSUMPTION DURING PREGNANCY:
Average consumption (for each trimester tick appropriate box)

	First 3 Months	Second 3 Months	Third 3 Months
Nil	1	5	9
< 1 drink per day	2	6	10
1 - 2 drinks per day	3	7	11
3 - 5 drinks per day	4	8	12
> 5 drinks per day	4	8	12
Mother declined to answer	13		

PREGNANCY

PREVIOUS PREGNANCIES (excluding this pregnancy)

Total number of:

14. PREVIOUS PREGNANCIES

15. PREVIOUS CHILDREN NOW LIVING

16. BORN ALIVE, NOW DEAD

17 STILLBORN

18 PREVIOUS MULTIPLE PREGNANCY
Twins Triplets Other

19. DATE OF LNMP

20. THIS DATE - certain ( ) 1
- Not certain ( ) 2

21. EXPECTED DUE DATE:
Dates Calculated LNMP
Ultrasound

22. COMPLICATIONS OF PREGNANCY:
- None ( ) 1
- Threatened Abortion (under 20 weeks) ( ) 2
- Urinary Tract Infection ( ) 3
- Pregnancy Hypertension ( ) 4
- A.P.H. ( ) 5
- Premature Rupture of Membranes ( ) 6
- Gestational Diabetes ( ) 7
- Genital Herpes ( ) 8
- Other

23. MEDICAL CONDITIONS:
- None ( ) 1
- Diabetes - pre-existing ( ) 2
- Epilepsy ( ) 3
- Essential Hypertension ( ) 4
- Renal Disease ( ) 5
- Other

LABOUR AND DELIVERY

24. ONSET OF LABOUR:
- Spontaneous ( ) A
- Induced ( ) B
- No Labour ( ) C

25. INDICATION FOR INDUCTION .....

26. PRESENTATION:
- Vertex ( ) 1
- Breech ( ) 2
- Other ( ) 3
- Unknown ( ) 4

27. AUGMENTATION OF LABOUR:
- Yes ( ) 2
- No ( ) 1

28. TYPE OF DELIVERY:
- Spontaneous ( ) A
- Vacuum - successful ( ) B
- Vacuum - failed ( ) C
- Forceps - successful ( ) D
- Forceps - failed ( ) E
- Assisted breech ( ) F
- Caesarean - elective ( ) G
- Caesarean - emergency ( ) H
- Planned - emergency (elective) ( ) I

29. INDICATION/INTERVENTION AT DELIVERY:
- Previous caesarean ( ) 1
- Fetal distress ( ) 2
- Cephalopelvic disproportion ( ) 3
- Other .. ..

30. ACCOUCHEUR:
- Medical practitioner ( ) 1
- Midwife ( ) 2
- Other ( ) 3

31. ANAESTHESIA/ANALGESIA:
- None ( ) 1
- Inhalational ( ) 2
- General ( ) 3
- Regional ( ) 4
- Local to perineum ( ) 5
- Narcotics ( ) 6

32. DURATION OF LABOUR:
- Stage 1 1
- Stage 2 2
- Stage 3 3
- Total 4

33. COMPLICATIONS OF LABOUR, DELIVERY:
- None ( ) 1
- Fetal distress ( ) 2
- Cephalopelvic disproportion ( ) 3
- 3° perineal tear ( ) 4
- Fulminating hypertension ( ) 5
- Post partum haemorrhage ( ) 6
- Cord prolapse ( ) 7
- Other .....

COMPLETE SECTION ON SEPARATION:
Attach to Mother and Baby's Inpatient Summaries (HA22). Forward to Epidemiology Branch, P.O. Box 8172, Stirling Street, PERTH, 6001 after discharge of mother and/or baby whichever is later.

MIDWIFE:

Name .....

Signature .....

22
Reg No. Date

BABY

Separate form for each baby

34. ADOPTION Yes ( ) 2 No ( ) 1

35. BIRTH DATE

36. TIME (24 hr clock)

37. PLURALITY:
- Single birth ( ) 1
- First twin ( ) 2
- Second twin ( ) 3
- Other multiple birth ( ) 4
- (specify baby number .... of ....)

38. SEX:
- Male ( ) 1
- Female ( ) 2
- Indeterminate ( ) 3

39. CONDITION:
- Liveborn ( ) 1
- Stillborn - A.P. ( ) 2
- Stillborn - I.P. ( ) 3
- Stillborn - U/K ( ) 4

40. BIRTHWEIGHT (grams)

41. LENGTH (cms)

42. HEAD CIRCUMFERENCE (cms) (at birth)

43. TIME TO SPONTANEOUS RESPIRATION (mins)

44. RESUSCITATION (excludes routine suction):
- None ( ) 1
- Intubation ( ) 2
- Oxygen ( ) 3
- Bag & mask ( ) 4
- Other .....

45. APGAR SCORE:
- 1 minutes
- 5 minutes

46. ESTIMATED GESTATION (clinical assessment in weeks)

47. CONGENITAL MALFORMATIONS:
- None ( ) 1
- CNS ( ) 2
- Alimentary ( ) 3
- Respiratory ( ) 4
- Genito-urinary tract ( ) 5
- Cardiac/C.V.S. ( ) 6
- Skeletal ( ) 7
- Other .....

48. BIRTH TRAUMA:
- None ( ) 1
- Soft tissue ( ) 2
- Erbs palsy ( ) 3
- Facial palsy ( ) 4
- Bone fracture/dislocation ( ) 5
- Other .....

49. SPECIAL INTENSIVE CARE (wholedays only)

50. NEONATAL INTENSIVE CARE (wholedays only)

51. SEPARATE HA22 FOR BABY:
Yes, attached ( ) 1

BABY'S SEPARATION DETAILS

52. DATE OF DISCHARGE/ TRANSFER OR DEATH

53. GUTHRIE Yes ( ) 2 No ( ) 1

54. TYPE OF SEPARATION:
- Discharged home ( )
- Died ( )
- Transferred to ( )
- .....

APPENDIX C

Health Department of W.A.

INPATIENT SUMMARY

D

HA 2

Admission No.

Unit Record No.

Year last hospitalised in this hospital

If hospitalised in past year — when .....

and if outside WA — where .....

Medicare No.

Hospital.....

Ward..... Doctor.....

CHARGEABLE PATIENTS ACCOUNTING DETAILS

PATIENT DETAILS

Admission — Date DAY MONTH YEAR 1 9

— Time (24 hour clock)

Surname.....

Forenames.....

Residential Address.....

.....

Postcode of Address

Payment Classification.....

Sex (✓) Male ( ) • Female ( )

Age.....yrs Date of Birth DAY MONTH YEAR 1

Country/State of Birth.....

Marital Status.....

Occupation.....

Race (✓) Non-Aboriginal ( ) Aboriginal ( )

Religion.....

Admitted from.....

Admission Type (✓) Booked ( ) Unbooked ( )

SEPARATION DETAILS

Separation Date DAY MONTH YEAR 1 9

Separation Type.....

Discharged/Transferred to.....

.....

PERSON OR PARTY RESPONSIBLE FOR PAYMENT

(Don't complete if person is the patient)

Surname: .....

Forenames: .....

Address: .....

.....

Postcode of Address

Relationship to Patient .....

Telephone Home

Bus

PRIVATE PATIENTS — HEALTH INSURANCE ARRANGEMENTS

Insured Yes ☐ No ☐

Fund..... Table.....

Membership No. .....

Hospitalisation Cert. No.

NEXT OF KIN, FRIEND OR GUARDIAN
(where different to above)

Surname.....

Forenames.....

Residential Address.....

.....

Postcode of Address

Relationship to Patient.....

Home

Bus.

Other Emergency Message detail

.....

Principal Condition Treated..... (†)

.....

Underlying Cause (where different).....

Other Conditions Present.....

Doctor mainly responsible for inpatient care..... M.B. Reg. No.

If the principal condition resulted from an accident, poisoning or violence, what was the -

a) External cause..... b) Place of occurrence.....

Operation/Procedure performed { Principal..... Other.....

Doctor performing principal operation/procedure..... M.B. Reg. No.

FILING SEQUENCE A1

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