Title

Accuracy of postpartum haemorrhage data in the 2011 Victorian Perinatal Data Collection:
results of a validation study

Ms Margaret FLOOD (corresponding author)

PhD candidate

Judith Lumley Centre, La Trobe University,

215 Franklin Street, Melbourne,

Victoria, Australia¹

m.flood@latrobe.edu.au

Ph: 03 9479 8782 Mob: 0448 012 129

Wendy POLLOCK

Director, Maternal Critical Care, Melbourne, Victoria, Australia², *and*

Honorary Research Fellow

School of Nursing and Midwifery, La Trobe University, Bundoora, Victoria, Australia³, *and*

Honorary Senior Research Fellow

Department of Nursing

The University of Melbourne, Melbourne, Victoria, Australia⁴

W.Pollock@latrobe.edu.au

Ph: 0407 942 850

Susan J. McDONALD

Professor of Midwifery

La Trobe University/ Mercy Health. Discipline Advisor, Midwifery

School of Nursing and Midwifery, La Trobe University, Bundoora, Victoria, Australia³

s.mcdonald@latrobe.edu.au

Ph: +61 3 8458 4945

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1111/ajo.12692](https://doi.org/10.1111/ajo.12692)

This article is protected by copyright. All rights reserved

Mary-Ann DAVEY

Senior Research Fellow

Department of Obstetrics and Gynaecology, Monash University, Clayton, Victoria, Australia⁵
and

Honorary Senior Research Fellow

Judith Lumley Centre, La Trobe University, Melbourne, Victoria, Australia¹

mary-ann.davey@monash.edu

Ph: +61 3 9594 5298

¹Judith Lumley Centre, School of Nursing and Midwifery, La Trobe University,
Melbourne, Victoria, Australia

²Maternal Critical Care, Melbourne, Victoria, Australia

³School of Nursing and Midwifery, La Trobe University, Heidelberg, Victoria, Australia

⁴Department of Nursing, The University of Melbourne, Melbourne, Victoria, Australia

⁵Department of Obstetrics and Gynaecology, Monash University, Clayton, Victoria, Australia

Conflicts of interest: In addition to her University appointment, Dr Davey works part-time at Safer Care Victoria. All other authors declare that they have no conflicts of interest.

Sources of outside support for research: Ms Flood was the recipient of an APA scholarship during the period of research and preparation of this manuscript. We gratefully acknowledge the following generous benefactors: La Trobe University School of Nursing and Midwifery, Nurses Memorial Centre and Australian College of Midwives, Victorian Branch.

MS. MARGARET M FLOOD (Orcid ID : 0000-0001-6820-039X)

Article type : Original Manuscript

Title

Accuracy of postpartum haemorrhage data in the 2011 Victorian Perinatal Data Collection:
results of a validation study

Short title: Accuracy of postpartum haemorrhage data

Word count:

Abstract: 250

Main document: 2530

Total: 2780

Tables: 3

Figures: 1

Key words: postpartum haemorrhage, morbidity, validation studies, data collection, data
accuracy

Abstract

Background

The postpartum haemorrhage (PPH) rate in Victoria in 2009 for women having their first birth, based on information reported to the Victorian Perinatal Data Collection (VPDC), was 23.6% (primiparas). Prior to 2009 PPH was collected via a tick box item on the perinatal form. Estimated blood loss (EBL) volume is now collected and it is from this item the PPH rate is calculated. Periodic assessment of data accuracy is essential to inform clinicians and others who rely on these data of their quality and limitations.

Aims

This paper describes the results of a state-wide validation study of the accuracy of EBL volume and EBL-related data items reported to VPDC.

Materials and methods

PPH data from a random sample of 1% of births in Victoria in 2011 were extracted from source medical records and compared with information submitted to the VPDC. Accuracy was determined, together with sensitivity, specificity, positive predictive value and negative predictive value for dichotomous items.

Results

Accuracy of reporting for $\text{EBL} \geq 500$ mL was 97.2% and for $\text{EBL} \geq 1500$ mL was 99.7%. Sensitivity for $\text{EBL} \geq 500$ mL was 89.0% (CI 83.1-93.0) and for $\text{EBL} \geq 1500$ mL was 71.4% (CI 35.9-91.8). Blood product transfusion, peripartum hysterectomy and procedures to control bleeding were all accurately reported in >99% of cases.

Conclusions

Most PPH-related data items in the 2011 VPDC may be considered reliable. Our results suggest $\text{EBL} \geq 1500$ mL is likely to be under-reported. Changes to policies and practices of recording blood loss could increase accuracy of reporting further.

Background

Postpartum haemorrhage (PPH) is a leading cause of maternal morbidity and of maternal death worldwide.⁽¹⁻⁵⁾ In 2009, 23.6% of primiparous Victorian women were reported to have had a primary postpartum haemorrhage (PPH),⁽⁶⁾ an increase from 14.0% for primiparous women the previous year.⁽⁷⁾ Overall, of the 71,500 women who gave birth in 2011 in Victoria, 15,389 (21.6%) experienced a PPH and 943 (1.3%) a severe PPH of ≥ 1500 mL.⁽⁸⁾

The Victorian Perinatal Data Collection (VPDC) is the source for reported PPH rates in Victoria. Up to 2008, the occurrence of PPH was collected by ticking a box on the perinatal

report form, last validated for births in 2003.⁽⁹⁾ Several new data items including 'estimated blood loss (mL)' (EBL) were added to the VPDC in 2009, and a PPH variable is computed from this. A further change was the adoption of the World Health Organization (WHO) definition of primary PPH: blood loss from the genital tract of ≥ 500 mL in the first 24 hours following birth⁽¹⁰⁾ by either vaginal or abdominal routes. Previously, ICD-10AM definitions were used (PPH ≥ 500 mL for vaginal births and ≥ 750 mL for caesarean births [CS]). Since 2009, the reported PPH rate based on the new perinatal data items and WHO definition (which does not distinguish between mode of birth) has risen.^(6, 10, 11)

The extent to which the higher rates since 2009 were driven by a real increase in PPH, by the different definition of PPH or by the effect of reporting actual volume rather than yes or no to PPH, is unknown. With as many as one in five women experiencing a PPH⁽⁸⁾ and one in eight a PPH-associated morbidity⁽⁴⁾ even a small increase in rates of PPH translates to many more episodes of PPH and associated morbidities including anaemia, decreased lactation,⁽¹²⁾ need for blood transfusion^(2, 4, 12) and hysterectomy⁽²⁾ with implications for mothers and, due to the need for heightened levels of treatment, clinicians.⁽³⁾ It was considered important to validate the accuracy of reporting of the new EBL and EBL-related data items.

Aim

The overall aim of this study was to assess the reliability of selected data items in the VPDC for births in 2011. This paper focuses on accuracy of reporting of blood loss and related items.

Methods

Detailed VPDC validation study methods and other results are reported separately⁽¹³⁾ and follow those described by Davey.⁽⁹⁾ Briefly, a validation study that included a sample of ten public and four private hospitals and two homebirth practitioners was conducted in Victoria in 2013-14. The three tertiary maternity services were systematically included in order to include cases with rare outcomes to enable assessment of the accuracy with which they are reported. A stratified random sample of the remaining public non-tertiary and private hospitals offering obstetric services, from metropolitan, regional and rural Victoria was drawn. A random sample of 1% of births in Victoria throughout 2011 ($n=737$) was selected from these. A 1% sample enabled (for example) detection of an absolute excess discrepancy

rate of 1% for data expected to be accurate in 99.5% of cases (e.g. 'method of birth') and an excess discrepancy rate of 4% in items expected to be 95% accurate (e.g. 'birthweight') (80% power, $p < 0.05$).⁽⁹⁾ Data in the VPDC were compared with information in the original medical record to determine accuracy (matching). Medical record information was regarded as the 'gold standard'. Inaccurate data was categorised using a coding sheet as e.g. missing or incorrect. We looked for evidence of rounding of EBL volumes and of threshold bias (a tendency to report either just below or above a cut-off point). Validating the accuracy with which clinicians estimate blood loss was beyond the scope and resources of this study and not attempted.

Data analysis

Data were analysed using Stata 13.0.⁽¹⁴⁾ We calculated accuracy for all variables, sensitivity and specificity (95% confidence interval for both), and positive and negative predictive value for dichotomous variables. Accuracy indicates a perfect match between medical record and VPDC data. In addition to checking the accuracy of EBL, it was also recoded into two dichotomous variables to match VPDC reporting: 'Was the blood loss ≥ 500 mL?' (yes or no), and 'Was the blood loss $\geq 1,500$ mL?'. In order to optimise the clinical relevance of findings related to EBL reporting, we also calculated accuracy of reporting EBL that was ± 50 mL different and ± 100 mL different from that in the medical record. Homebirths were excluded from sensitivity analysis of EBL-related variables only due to small cell sizes ($n=2$). Two medical records were not available. For the purposes of analysing accuracy, if information for a data item was missing in both the medical record and the VPDC this was assessed as an accurate report of the medical record. Cases with missing values were excluded from sensitivity, specificity, positive predictive value and negative predictive value analyses.

Other variables examined were: 'blood product transfusion' and 'prophylactic oxytocic given'; 'manual removal of placenta', 'peripartum hysterectomy', 'uterine balloon tamponade' and 'B-Lynch suture' were recoded into a single variable 'procedures to control bleeding'.

Ethics approval

Approval for the study was obtained from La Trobe University Human Research Ethics Committee (Study 13-041), and the Consultative Council on Obstetric and Paediatric

Mortality and Morbidity (CCOPMM). Ministerial approval for secondment of staff to CCOPMM for the validation was also obtained.

Results

The three tertiary institutions and eleven hospitals selected in the randomisation (two public and three private metropolitan hospitals and five public and one private rural hospital), participated in the validation study. Characteristics of randomly selected cases were broadly comparable to VPDC data for all births in Victoria for 2011.⁽⁸⁾

The majority of data items, including EBL, were reported accurately (Table 1). Reporting of $\text{EBL} \geq 1500 \text{ mL}$ was found to have matched information in the medical record to a higher degree than reporting of $\text{EBL} \geq 500 \text{ mL}$. Accuracy of EBL reporting increased from 89.6% (exact match) to 93.4% when a leeway of $\pm 50 \text{ mL}$ was allowed and to 96.2% when $\pm 100 \text{ mL}$ was considered. Maternal blood transfusion and prophylactic oxytocic use also were reported with high levels of accuracy.

Table 2 reports the sensitivity and specificity, positive predictive value and negative predictive value of data items related to blood loss by hospital type and birth method. Sensitivity results were highest for 'prophylactic oxytocic' variables ($\geq 99.6\%$) and did not differ by hospital category or birth type (data not shown). Sensitivity for $\text{EBL} \geq 500 \text{ mL}$ was high and specificity $>99\%$ in all three hospital sectors and for all methods of birth. Sensitivity for $\text{EBL} \geq 500 \text{ mL}$ was highest at tertiary institutions (95.6%) with those for both public non-tertiary and private hospitals similar at between 86–87% (data not shown).

Sensitivity and specificity for 'procedures to control blood loss' data items were similarly high. Specificity results were 96–100% for all data items except for the 'prophylactic oxytocic' item for which the negative predictive value was also low. For all other items the negative predictive value was $\geq 93.0\%$. Positive predictive values (indicating that women reported to have a condition did have that condition) were also excellent, exceptions being for 'procedures to control blood loss' and 'maternal blood product transfusion' at tertiary hospitals. Private hospitals correctly reported no recorded cases of $\text{EBL} \geq 1500 \text{ mL}$ and no cases of blood product transfusion given.

The range of EBL reported for all public hospitals (50–2000 mL) was higher than that for private hospitals (50–1200 mL). The proportion of women with EBL ≥ 500 mL reported by individual public hospitals varied from 7.7% to 40.0% and from 2.9% to 61.5% for private hospitals.

The majority of EBL volumes were reported at intervals of 50 or 100 mL (98%) (Figure 1). We looked for evidence of ‘threshold bias’ but found none: four cases were reported in the range 451–499 mL; zero cases between 1450–1499 mL.

Reasons for discrepancies between the EBL reported to VPDC and that in the medical record included that information was found to be missing from or recorded ambiguously in the medical record or reported incorrectly to VPDC. Almost half of the incorrectly reported cases occurred because incomplete EBL totals were reported to VPDC. In two cases errors were made by auditors. Factors noted as affecting accuracy are provided in Table 3.

Discussion

We present results of a validation study of EBL and EBL-related data in the VPDC for births in 2011 including for three data items (‘blood product transfusion’, ‘prophylactic oxytocic given’ and ‘estimated blood loss mL’) whose accuracy has been assessed for the first time. Information recorded in medical records in our sample was compared with information submitted to VPDC to determine if it matched. Our study did not attempt to assess whether the volume reported in the medical record was in fact an accurate estimate of the volume of blood lost. This study demonstrates a high level of accuracy overall for the items reported here.

Accuracy for the three new data items ranged from 89.6–99.3%. Sensitivity and specificity results for ‘prophylactic oxytocic given’ were excellent. However, the sensitivities for ‘EBL ≥ 1500 mL’ and ‘blood product transfusion’ were only moderate (71.4% and 75.0% respectively). Both these items were relatively rare in the cases reviewed. The high accuracy reflected that the vast majority were correctly reported as not having occurred, however there was a degree of under-reporting of these items. A small number of cases that were documented in the medical records were not reported as such to the VPDC resulting in approximately 30% under-reporting of severe PPH in the study sample.

Whether this result is representative of the Victorian population as a whole is not known as our sample was not powered for rare events. However, severe PPH (EBL ≥ 1500 mL) and blood product transfusion are used to monitor serious maternal morbidity in Australia, as two of the indicators in the Perinatal National Best Endeavours Data Set.⁽¹⁵⁾ PPH is a major cause of maternal morbidity.^(2, 4, 12, 16) With PPH rates increasing and the potential impacts for women,^(2, 12, 16) the need for accurate data – as a basis for population health surveillance and for research – is paramount.⁽¹¹⁾

Low sensitivities for reporting of PPH were found in NSW validation studies by Roberts et al. using admitted episodes (not perinatal) data, for both public (76.5%) and private (60.6%) hospitals⁽¹⁷⁾ and by Taylor et al. (59%) (for both public and private hospitals with 50 or more births).⁽¹⁸⁾ The higher sensitivity for EBL ≥ 500 mL in the current study (89% with narrow confidence intervals) is likely to be related to the source of the reported data, with Victorian data reported directly by attending midwives, while the NSW studies are based on hospital discharge (administrative) data.

In a UK study by Briley et al. a marked preference for rounding as well as threshold bias was noted.⁽¹⁹⁾ We found strong evidence suggesting it was customary to round EBL volumes (98% of cases were reported as multiples of 50) but no evidence of threshold bias. Briley et al. also found an error rate of 14% in EBL recorded in medical records compared with EBL in the hospital clinical electronic database, a slightly higher error rate than that of our own findings.⁽¹⁹⁾ Reported discrepancies in that study were most commonly due to errors in addition and reporting of incomplete total blood loss.⁽¹⁹⁾ In the current study we observed also that the EBL reported to VPDC was not updated to include blood lost throughout the first 24 hours following the birth. This is concerning. Having accurate updated information is a fundamental requirement because management protocols for PPH are initiated based on recorded EBL.

Hancock et al. and Schorn have identified numerous studies with reported underestimation of up to 89%.^(20, 21) Conversely, other researchers found overestimation of EBL by a range of clinical practitioners.^(22, 23) Sensitivities for EBL ≥ 1500 mL indicate under-reporting in this study. Blood loss at higher volumes was often to be found recorded incrementally in different parts of the medical record increasing the likelihood of a final total being overlooked. Reporting exact blood loss volume is more difficult than reporting a simple yes/no PPH item

as there are many more possible values. This is illustrated by results for the current study where, even when accuracy to within +/- 100 mL of that recorded in the medical record was allowed, results were slightly less accurate than for the previous VPDC validation study where accuracy of the PPH data item in tick box format was found to be excellent (97.4%).⁽⁹⁾

We noted some of the hospitals visited used a dedicated form to document management of PPH and the practice may have become more widespread since 2011. Such a form or electronic screen could be adapted (1) both to require and facilitate recording of blood loss for the full 24-hour period after birth for all women, with a continuation to management of PPH where EBL exceeds 499 mL and (2) to permit recording of cumulative totals (e.g. following perineal pad checks).

Likely benefits to busy clinicians of having one form on which to document blood loss may include: easily located up-to-date 24-hour total, minimising time spent searching the medical record; enabling midwives who have not been involved in the woman's care to report the EBL total accurately; correct format (volume) for submission of information for the data item to the VPDC; cumulative total volume assists accurate addition; and improved clarity may reduce transcription errors.

Strengths and limitations

Strengths of this study are that it was conducted state-wide at public and private hospitals of all levels of service complexity and numbers of births. Non-tertiary hospitals were randomly selected. Our sample of randomly selected medical records representing 1% of births in Victoria for 2011 was of adequate size to allow analysis of groups for commonly occurring items. Rigorous data collection methods were employed by experienced auditors.⁽⁹⁾

A limitation of the study is that case numbers for rare events, such as $EBL \geq 1500$ mL, were low. However, accuracy of reporting also depends on correctly reporting that an event did not occur. In addition, validating the accuracy of EBL measurement was beyond the scope of this study. We accepted the EBL volume recorded in the medical record as the 'gold standard'; however, the documented EBL may not have matched actual EBL.

Conclusion and recommendations

We found that the majority of EBL-related data items in the 2011 Victorian PDC may be considered reliable for research and reporting purposes. The reported levels of accuracy for EBL are likely to apply to data related to births since January 2009. The under-reporting of total EBL found in our study suggests that the reported PPH rate may be underestimated. Accurate estimation of EBL and its recording in the medical record is essential for accurate reporting to VPDC. This could be improved by recording ongoing EBL in the correct format (mL) and as cumulative totals. Implementation of a dedicated form to record EBL totals may be beneficial. Examination of barriers to recording 24-hour total EBL also may be worthwhile. We recommend institutions conduct internal audits following any changes to practice to assess and report quality of EBL data.

In light of our findings, the upward trend in the primary PPH rate warrants investigation to determine possible risk factors responsible.

References

1. Knight M, Kenyon S, Brocklehurst P, Neilson J, Shakespeare J, Kurinczuk JJ, et al. Saving Lives, Improving Mothers' Care - Lessons learned to inform future maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009–12. Oxford: National Perinatal Epidemiology Unit, University of Oxford, 2014.
2. Kramer MS, Berg C, Abenhaim H, Dahhou M, Rouleau J, Mehrabadi A, et al. Incidence, risk factors, and temporal trends in severe postpartum hemorrhage. *Am J Obstet Gynecol*. 2013;209(5):449.e1-7.
3. Callaghan WM, Creanga AA, Kuklina EV. Severe maternal morbidity among delivery and postpartum hospitalizations in the United States. *Obstet Gynecol*. 2012;120(5):1029-36.
4. Roberts CL, Ford JB, Algert CS, Bell JC, Simpson JM, Morris JM. Trends in adverse maternal outcomes during childbirth: a population-based study of severe maternal morbidity. *BMC Pregnancy Childbirth*. 2009;9:7.
5. Knight M, Callaghan WM, Berg C, Alexander S, Bouvier-Colle MH, Ford JB, et al. Trends in postpartum hemorrhage in high resource countries: a review and recommendations from the International Postpartum Hemorrhage Collaborative Group. *BMC Pregnancy Childbirth*. 2009;9:55.
6. Consultative Council on Obstetric and Paediatric Mortality and Morbidity. Annual report for the year 2009. Melbourne: State Government of Victoria, Department of Health; 2012.
7. Consultative Council on Obstetric and Paediatric Mortality and Morbidity. Births in Victoria: 2007 and 2008. Melbourne: State Government of Victoria, Department of Health, 2011.

8. Consultative Council on Obstetric and Paediatric Mortality and Morbidity. Victoria's Mothers and Babies, Victoria's Maternal, Perinatal, Child and Adolescent Mortality, 2010 and 2011. Melbourne: State Government of Victoria, 2014.
9. Davey MA, Sloan ML, Palma S, Riley M, King J. Methodological processes in validating and analysing the quality of population-based data: a case study using the Victorian Perinatal Data Collection. *Health Inf Manag.* 2013;42(3):12-9.
10. World Health Organization. WHO recommendations for the prevention and treatment of postpartum haemorrhage. Geneva: 2012.
11. Consultative Council on Obstetric and Paediatric Mortality and Morbidity. Victoria's Mothers, Babies and Children 2012 and 2013. Section 2: Data, tables and figures. Melbourne: Department of Health and Human Services, Victoria, 2016.
12. Devine PC. Obstetric hemorrhage. *Semin Perinatol.* 2009;33(2):76-81.
13. Flood MM, McDonald SJ, Pollock WE, Davey M-A. Data accuracy in the Victorian Perinatal Data Collection: Results of a validation study of 2011 data. *Health Inf Manag.* 2017;1833358316689688.
14. StataCorp. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP; 2013.
15. Australian Institute of Health and Welfare. Perinatal NBEDS 2016-2017 [Internet] Available from: <http://meteor.aihw.gov.au/content/index.phtml/itemId/605250.2016> [cited 2017 12 April].
16. Bateman BT, Berman MF, Riley LE, Leffert LR. The epidemiology of postpartum hemorrhage in a large, nationwide sample of deliveries. *Anesth Analg.* 2010;110.
17. Roberts CL, Algert CS, Ford JB, Morris JM. Reporting of routinely collected data by public and private hospitals. *Australian & New Zealand Journal of Obstetrics & Gynaecology.* 2008;48(5):521-2.
18. Taylor LK, Travis S, Pym M, Olive E, Henderson-Smart DJ. How useful are hospital morbidity data for monitoring conditions occurring in the perinatal period? *Australian & New Zealand Journal of Obstetrics & Gynaecology.* 2005;45(1):36-41.
19. Briley A, Seed PT, Tydeman G, Ballard H, Waterstone M, Sandall J, et al. Reporting errors, incidence and risk factors for postpartum haemorrhage and progression to severe PPH: a prospective observational study. *BJOG.* 2014;121(7):876-88.
20. Hancock A, Weeks A, Lavender D. Is accurate and reliable blood loss estimation the 'crucial step' in early detection of postpartum haemorrhage: an integrative review of the literature. *BMC Pregnancy Childbirth.* 2015;15(1):230.
21. Schorn MN. Measurement of blood loss: review of the literature. *Journal of Midwifery & Women's Health.* 2010;55(1):20-7.

22. Razvi K, Chua S, Arulkumaran S, Ratnam S. A Comparison Between Visual Estimation and Laboratory Determination of Blood Loss During the Third Stage of Labour. *Aust N Z J Obstet Gynaecol.* 1996;36:152 - 4.
23. Lilley G, Burkett-St-Laurent D, Precious E, Bruynseels D, Kaye A, Sanders J, et al. Measurement of blood loss during postpartum haemorrhage. *International Journal of Obstetric Anesthesia,* 2015;24(1):8-14.

Table 1 Accuracy of reporting of blood loss-related variables for births in the Victorian Perinatal Data Collection in 2011 (n = 735)

Data item	New in 2009	Available records		Accuracy	
		n	n	%	
Estimated blood loss (mL):					
Exact match†	√	712	638	89.6	
+/- 50 mL†	√	712	665	93.4	
+/- 100 mL†	√	712	685	96.2	
Postpartum haemorrhage:					
≥500 mL†	√	712	692	97.2	
≥1500 mL†	√	712	710	99.7	
Peripartum hysterectomy		735	735	100.0	
Procedures to control bleeding†‡		735	735	100.0	
Blood product transfusion	√	735	730	99.3	
Prophylactic oxytocic given	√	735	719	97.6	
Manual removal of placenta		735	648	88.0	

†Denominator for estimated blood loss and postpartum haemorrhage excludes cases with missing values

‡Procedures to control blood loss: comprising data items ‘manual removal of placenta’, ‘peripartum hysterectomy’ and ‘uterine balloon tamponade/B-Lynch suture’

Table 2 Sensitivity, specificity, positive and negative predictive values of dichotomous variables related to estimated blood loss for births in the Victorian Perinatal Data Collection in 2011

Data item	Denominator	Cases	Sensitivity (95% CI)	Specificity (95% CI)	PPV	NPV
		n =	%	%	%	%
Estimated blood loss ≥ 500 mL						
All sites†	711	155	89.0 (83.1–93.0)	99.5 (98.4–99.8)	97.9	97.0
Public incl. tertiary hospitals	539	132	89.4 (83.0–93.6)	99.3 (97.9–99.8)	97.5	96.7
Private hospitals	172	23	87.0 (67.9–95.5)	100.0 (97.5–100.0)	100.0	98.0
Estimated blood loss ≥ 500 mL – by method of birth at all sites†						
Vaginal birth (all)	449	63	87.3 (76.9–93.4)	100.0 (99.0–100.0)	100.0	98.0
Vaginal birth (non-instrumental)	359	41	85.4 (71.6–93.1)	100.0 (99.0–100.0)	100.0	98.1
Vaginal birth (instrumental)	90	22	90.9 (72.2–97.5)	100.0 (94.7–100.0)	100.0	97.1
CS (all)	262	92	90.2 (82.4–94.8)	98.2 (94.9–99.4)	96.5	94.9
Planned CS – no labour	127	41	85.4 (71.6–93.1)	97.7 (92.0–99.4)	94.6	93.3
Planned CS – labour	nr	-	-	-	-	-
Unplanned CS – labour	90	38	94.7 (83.0–98.5)	100.0 (93.1–100.0)	100.0	96.3
Unplanned CS – no labour	36	8	100.0 (67.6–100.0)	96.4 (82.3–99.4)	88.9	1.00
Estimated blood loss ≥ 1500 mL†						
Public incl. tertiary	539	7	71.4 (35.9–91.8)	100.0 (99.3–100.0)	100.0	99.6

hospitals						
Private hospitals‡	172	0	-	-	-	-
Procedures to control blood loss§						
All sites	735	10	90.0 (59.6–98.2)	99.7 (99.0–99.9)	81.8	99.9
Prophylactic oxytocics						
All sites	724	711	99.6 (98.8–99.9)	84.6 (57.8–95.7)	99.7	78.6
Maternal blood product transfusion						
Public incl. tertiary hospitals	555	8	75.0 (40.9 – 92.9)	99.6 (98.7 – 99.9)	75.0	99.6
Private hospitals‡	176	0	-	-	-	-

CI: confidence interval; PPV: positive predictive value; NPV: negative predictive value; n: number of cases found in medical records;

nr: not reported: numbers too low

†Excluding homebirth due to small cell sizes

‡No cases >1,200mL

§Procedures to control blood loss: comprising data items ‘manual removal of placenta’, ‘peripartum hysterectomy’ and ‘uterine balloon tamponade/B-Lynch suture’

Table 3. Factors reducing accurate reporting of ‘estimated blood loss (mL)’ data item to the Victorian Perinatal Data Collection for births in 2011

Validation outcome	Factors affecting accuracy	Examples of discrepancies
Missing from medical record/ ambiguous	Includes missing, illegible and ambiguous information	Missing information: blood loss not recorded in record
		Information recorded illegibly Ambiguous information: blood loss recorded as e.g. ‘heavy’ or ‘moderate’ or ‘less than 400 mL’: not able to be quantified as a blood loss volume
Incorrectly reported	Incorrect totals submitted (various reasons)	Transcription errors, mistakes in addition, higher total missed e.g. total on birth summary higher than total submitted to VPDC, and totals not amended to include blood loss in the hours after birth (see below)
	EBL total not updated to include further blood loss occurring in the first 24 hours after birth i.e. EBL mL at completion of third stage reported but total not amended to include further loss occurring on postnatal ward	EBL total not updated: †Example 1: Following a birth EBL recorded on Birth Summary as 450 mL. In the next eight hours several perineal pads with a heavy blood loss recorded. EBL not updated. EBL of 450 mL reported to VPDC Example 2: Found at postnatal check 4 hours after birth: lax uterus, passage of piece of membranes and clots recorded. EBL not updated
Auditor error	Errors made by auditors when	Misreading, miscoding, overlooking information present, mistyping information

checking medical records into validation study database

†Examples for illustrative purposes only

Figure 1 Estimated blood loss volume (mL) recorded in medical records (n=712)[†]

[†]Excludes [cases with](#) missing values

Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Flood, M;Pollock, W;McDonald, SJ;Davey, M-A

Title:

Accuracy of postpartum haemorrhage data in the 2011 Victorian Perinatal Data Collection: Results of a validation study

Date:

2018-04-01

Citation:

Flood, M., Pollock, W., McDonald, S. J. & Davey, M. -A. (2018). Accuracy of postpartum haemorrhage data in the 2011 Victorian Perinatal Data Collection: Results of a validation study. AUSTRALIAN & NEW ZEALAND JOURNAL OF OBSTETRICS & GYNAECOLOGY, 58 (2), pp.210-216. <https://doi.org/10.1111/ajo.12692>.

Persistent Link:

<http://hdl.handle.net/11343/293387>