"Just in case". Use of large-bore peripheral intravenous catheters in parturient women: A global study

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Keywords Blood transfusion, catheterisation, peripheral, postpartum haemorrhage.

For referencing Webster J *et al.* "Just in case". Use of large-bore peripheral intravenous catheters in parturient women: A global study. Vascular Access 2019; 5(1):4-7.
DOI https://doi.org/10.33235/va.5.1.4-7

ABSTRACT

Objective The aim of the current study was to map a global picture of the practice of inserting large-bore peripheral intravenous catheters in parturient women.

Methods We analysed a sub-set of data from a prospective, multi-centre, international prevalence study, the One Million Global peripheral intravenous catheter study. The obstetric cohort was drawn from 163 maternity units in 35 countries (1477 women, 1577 catheters) and was collected between 1 June 2014 and 31 July 2015. Clinicians at each of the participating sites collected data using tools that had been previously validated. Results are reported as frequencies and proportions.

Results Overall, 42% of all peripheral intravenous catheters were large bore and of all catheters placed in females in obstetric units, 438 (70%) of these were placed in the hand or wrist. The phlebitis rate was higher in the large-bore group (12%) compared with those with smaller catheters (7%). Only 2% of women received blood products, but it was unclear which catheter was used for this purpose.

Conclusion Large-bore peripheral intravenous catheters are overused for vascular access in parturient women. They are painful and may cause vascular damage. If there is no indication, a catheter should not be placed at all.

Disclosure statement

The authors wish to declare the OMG study received unrestricted investigator-initiated research grants from Becton Dickinson (BD), CareFusion and 3M. B Braun provided funds for professional translation of data collection tools into several languages. All funds have been made payable to Griffith University or Western Sydney University and not to individual researchers.

Synopsis

Large-bore peripheral intravenous catheters are overused for vascular access in perinatal women. These catheters may lead to vascular damage and increase phlebitis risk.

INTRODUCTION

Approximately 830 women die from pregnancy or birth-related complications globally every day[1], with postpartum haemorrhage (PPH) being the major cause[2]. The incidence of PPH is difficult to quantify due to different definitions and methods used to estimate blood loss, but recent large studies, where PPH is defined as a blood loss of ≥ 500 millilitres (ml), report a PPH rate of 1.2–9%[3-7], with the highest rates in sub-Saharan Africa[7]. Variations in the inclusion and exclusion criteria of these studies may also contribute to disparity in the PPH rates.

Massive or severe PPH is defined variously as a blood loss ≥ 1,000 ml[4,7,8] or ≥ 1,500 ml[9,10]; bleeding requiring a blood transfusion[5]; or

bleeding requiring ≥ 8 bags of red blood cells[11,12]. The average rate for severe PPH is 1.2%, with a range of 0.02–4.5%, depending on how PPH is defined[4,5,7-12]. The most common cause of severe PPH, responsible for 27% of all maternal deaths[2], is uterine atony, which is the failure of the uterus to contract after the birth of a baby[4]. Consequently, to stimulate contractions, active management of the third stage of labour and use of oxytocin are widely recommended for PPH prophylaxis[13].

Another common strategy used in Australia and New Zealand to prepare for negative sequelae from severe PPH is the prophylactic insertion of a large-bore peripheral intravenous catheter (PIVC). In a recent Australian study, 88% of the 114 PIVCs placed in 95 perinatal women were 16-gauge or 18-gauge; 82% were placed in the hand or wrist; and 88% had extension tubing and a 3-way tap attached to the catheter[14]. Although these PIVCs are placed to facilitate rapid transfusion of blood products, the use of extension tubing and placement of the catheter in a small vein decreases the infusion flow rate by up to 76%[15,16]. In addition, although most women in the study had a large-bore catheter inserted, none were required for an urgent transfusion[14].

Insertion of a large-bore catheter, particularly in the hand or wrist is painful, around 4.5 on a 10-point scale[17] and intravenous access guidelines recommend that the smallest gauge catheter should be selected to avoid vessel damage[18], even when packed cells are transfused[19]. It is also likely, if a rapid transfusion was required, that a PIVC would be placed in the cubital fossa or another large vein. So, it remains unclear why the practice of placing large-bore catheters in maternity patients persists. We also wondered if the practice was routine in other countries.

AIM

To investigate the international prevalence of large-bore PIVC use in parturient women

MATERIALS AND METHODS

Study design, patient population and setting

Our study is a sub-analysis from a prospective, multi-centre, international prevalence study, the One Million Global (OMG) PIVC study. Study details have been described elsewhere[20] but, briefly, hospitals were recruited using diverse strategies such as social media, network connections, conference presentations, and word of mouth. Adult and paediatric hospital in-patients with a PIVC *in situ* on the day of the study were eligible for inclusion; written or verbal consent was obtained from the patient or their next-of-kin at the time of data collection. Approval was granted by the Griffith University Human Research Ethics Committee (reference number NRS/34/13/HREC); ethics approval and/or manager's approval was also required from each site prior to study commencement.

Data collection

Data was collected between 1 June 2014 and 31 July 2015. Clinicians at each of the participating sites collected data using tools that had been previously validated[21]. Items included catheter insertion characteristics, such as time, date and reason for insertion; catheter type and gauge; insertion site assessment, for signs of occlusion, infiltration, pain, and so on; dressing type and integrity; and information about any infusates or intravenous medications. Phlebitis was defined as any pain, redness, swelling, purulent discharge, or palpable venous cord at the PIVC insertion site.

Statistical analysis

We defined large-bore catheters as 14 to 18 gauge. Data management and analysis was undertaken using Stata 15 (StataCorp, College Station, Texas, USA) statistical software. Results are reported as frequencies and proportions. Proportions were calculated using the number of non-missing observations in the denominator. Missing data were not imputed. In obstetric units, missing values of *gender* were recoded to *female.*

RESULTS

In the main study, a total of 40,620 PIVCs in 38,161 patients were assessed from 416 participating hospitals in 51 countries[21]. Data for the obstetric cohort was drawn from 163 maternity units in 35 countries. South Africa contributed the most sites (28), followed by Australia (25 sites). In total, 1477 women accounted for 1525 PIVCs in obstetric units. China studied the greatest number of PIVCs (245/1525), followed by Turkey (196/1525).

Large-bore PIVCs comprised 624/1,493 (42%) of all PIVCs placed in females in obstetric units; 438 (70%) of these were placed in the hand or wrist. The phlebitis rate in obstetric units was 76/624 (12%) among those women with a large-bore catheter in place compared with a rate of 65/869 (7%) in those with a smaller catheter. A total of 245/1506 (16%) PIVCs in females in obstetric units had no identified reason for use (no intravenous fluids or medications) on the day of the study. Of these idle catheters, 42 (17%) showed signs of phlebitis, and this rate was much higher than for PIVCs in active use (103/1261; 8%). A total of 31 (2%) PIVCs were used for blood transfusion on the day of the study.

DISCUSSION

The aim of the current study was to investigate the international use of large-bore PIVCs in parturient women. We found an overall prevalence of 42%, almost 2.5 times greater than the rate of 14–18G PIVCs among the 40,620 catheters in the overall cohort, which indicates an overuse in obstetric patients.

One of the recommendations for immediate treatment of severe PPH is to place an additional large-gauge PIVC to facilitate the administration of red blood cells[22]. In this large, international cohort of parturient women, only 2.0% received a blood transfusion, although it is unclear how many of these were urgent and the size of the catheter used. The transfusion rate was similar to average rates from other sources[4,5,7-12], yet the fear

of haemorrhage occurring exposes women to a "just in case" approach and represents a pervasive and unnecessarily invasive practice.

While placing a large-bore catheter may seem an innocuous intervention, it carries many risks for the individual. The most important of these is vascular damage or scarring, which occurs when a large catheter is placed in a small vein, which may restrict future access opportunities and greatly increases the risk of thrombus formation[2]. Additionally, phlebitis is more likely to be diagnosed in large-bore catheters compared with smaller gauge catheters due to mechanical or chemical irritation of the endothelial layer[18,23]. In our study, a 67% higher rate of phlebitis was observed in those with large-gauge catheters and, although rare, phlebitis has been associated with the much more serious condition, catheter-related bloodstream infection[24].

In the current study, 70% of all PIVCs were placed in the hand or the wrist; apart from potential vascular damage and insertion pain, such veins are unsuitable for rapid blood infusion due to increased peripheral resistance from their smaller vessel diameter. Consequently, placement of a second or third 16- to 18-gauge PIVC in a large vein is recommended in the case of a massive haemorrhage[22-25]. This recommendation implies, for the initial catheter, that a smaller gauge would have been adequate for the administration of fluids or medications in all women.

STRENGTHS AND LIMITATIONS

The major strength of the study was its size and the number of countries included; it represents the first attempt to quantify the international use of large-bore PIVCs for vascular access in parturient women. The study was exposed to the usual limitations associated with prevalence studies. Data was collected on one day in each hospital, so results would have been more rigorous if a prospective cohort design had been used. For example, we only asked if the woman had received a blood transfusion on the day of data collection and if the reason for the PIVC was to transfuse blood. It is possible that the woman could have been transfused at an earlier time. However, irrespective of the study design, our PPH rate matched those from other studies, so we feel reasonably confident that they are representative of the populations from which they were drawn. We are also unsure if blood transfusions were for catastrophic bleeds, delivered under emergency conditions, or for other reasons. In the Australian study, all the transfusions were non-urgent, delivered over several hours and could have been delivered through a 20-gauge catheter because of a slower required rate for non-urgent transfusions[14].

We did not have a denominator, that is, we do not know the number of women who were in-patients in maternity departments on the day of data collection; only the number who had a catheter *in situ.* Consequently, we cannot estimate the proportion of women in whom any catheter is placed.

CONCLUSION

Large-bore PIVCs are overused for vascular access in perinatal women. Considering the associated risks, careful attention should be given to inserting the right gauge catheter for specific purposes and, if there is no indication, a catheter should not be placed in a vein at all.

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