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A study of the healthcare resource use for the management of postpartum haemorrhage in France, Italy, the Netherlands, and the UK

Jessica Richardson [a,1,2], Georgia Hollier-Hann [a,*,1], Kathryn Kelly [a], Maria Chiara Alvisi [b], Cathy Winter [c], Irene Cetin [d], Timothy Draycott [c], Thierry Harvey [e], Gerard H.A. Visser [f], Yum L. Yip Sonderegger [g], Julie Perroud [g,3]

[a] GENESIS Research, West One, Forth Banks, Newcastle Upon Tyne, United Kingdom
[b] Policentro Pediatrico, Milan, Italy
[c] North Bristol NHS Trust, Bristol, United Kingdom
[d] Vittore Buzzi Children's Hospital, Milan, Italy
[e] Hospital Group Diaconesses, Paris, France
[f] University Medical Centre, Utrecht, Netherlands
[g] Ferring Pharmaceuticals, 1162 Saint-Prex, Switzerland

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ABSTRACT

Objective: Postpartum haemorrhage (PPH) complicates approximately 5% of births worldwide and is a leading direct cause of maternal death. Rates of PPH are increasing in many developed countries, particularly PPH related to uterine atony. There is a lack of published up-to-date information about healthcare resource use associated with management of PPH following vaginal birth. The objective of this study was to describe healthcare resource use for the management of minor PPH (blood loss 500–1,000 ml) and major PPH (blood loss > 1,000 ml) compared to uncomplicated birth (no PPH) following hospital vaginal birth in France, Italy, the Netherlands, and the UK.

Study design: In-depth interviews with two midwives from each participating country were conducted to establish differences in resource use for the management of minor PPH, major PPH, and uncomplicated birth. A web-survey was then developed and one obstetrician per participating country reviewed the survey. In total, 100 midwives (25 per country) completed the survey. Results were discussed at a multi-professional consensus meeting of midwives and obstetricians/gynaecologists (n = 6).

Results and conclusions: Midwives participating in the survey estimated that 80% of women receive Active Management of the Third Stage of Labour (AMTSL) and 93% of participants specified that uterotonics would routinely be used during AMTSL. Most participants (84%) reported that blood loss is routinely measured in their hospital, using a combination of methods. PPH is associated with increased healthcare resource use, including administration of additional uterotonics and use of additional medical interventions, such as urinary catheter, intravenous fluids, and possible requirement for surgery. The number of nurses, obstetricians/gynaecologists, and anaesthetists involved in the management of PPH increases with the occurrence and severity of PPH, as well as the proportion of healthcare personnel providing continuous care. Women may spend an additional 24 h in hospital following major PPH compared to uncomplicated birth. The results of this study highlight the burden of PPH management on healthcare resources. To reduce costs associated with PPH, prevention is the most effective strategy and can be enhanced with the use of an effective uterotonic as part of the active management of the third stage of labour.

Introduction

Every day, almost 200 women worldwide die from bleeding complications after childbirth, known as postpartum haemorrhage (PPH) [1]. Uterine atony (insufficient uterine contraction after delivery of the placenta) is the primary cause of 58–90% of PPH

* Corresponding author at: GENESIS Research, 7B, West One, Forth Banks, Newcastle upon Tyne NE1 3PA, United Kingdom.
E-mail address: solutions@genesisrg.com (G. Hollier-Hann).
[1] These authors contributed equally.
[2] Present address: AMICULUM Access, Bollington, UK.
[3] Present address: Longirod, Switzerland.

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cases [2–4]. Rates of PPH are increasing in many developed countries due to increasing rates of uterine atony [5–8].

Uterotonics are considered the gold standard of care for PPH prevention and treatment [9]. They cause the uterus to contract and are administered as part of the Active Management of the Third Stage of Labour (AMTSL), interventions performed after delivery of the newborn that aim to prevent PPH. Components of AMTSL include uterotonic administration, early cord clamping (delayed cord clamping was recently suggested as more beneficial for the infant), and controlled cord traction [10].

In the case of a PPH event, women may require transfer to surgery, the intensive care unit (ICU), and/or the high dependency unit. PPH may result in complications including renal failure, respiratory failure, sepsis, and death [2]. PPH is also associated with long-term psychological morbidity [11–14] and can affect breastfeeding and mother-baby bonding [15–17].

AMTSL is recommended by the World Health Organisation [18] and in guidelines from France [19], Italy [20], the Netherlands [21] and the UK [22]. However, there is variation in components and uterotonics used. Care during the third stage of labour has been assessed in France [23], the Netherlands [24,25], the UK [26,27], and Europe [28]. A UK survey found that 73% of respondent midwives and 93% of obstetricians reported always/usually using AMTSL [27]. A survey of maternity units in Europe described considerable variations between and within countries in AMTSL policies [28]. The proportion of surveyed units using the full AMTSL package ranged from < 20–77%, with prophylactic uterotonics recommended as standard policy in 55–100% of units [28].

There is a lack of recently published information about healthcare resource use (HCRU) associated with PPH management. Survey-based studies of PPH management policies in Europe are limited to pharmacological and surgical interventions [23,29]. Small studies reporting expert opinion and data from single UK hospitals indicated that resources for PPH management include medical interventions, additional healthcare personnel, and increased hospital stay [30,31]. An evaluation of PPH management in the UK reported that 65.4% of women required at least one additional uterotonic for PPH treatment, with consultants more likely to be involved in major PPH treatment, but did not provide a comprehensive overview of total HCRU for PPH management [26].

The objective of this study was to describe HCRU in hospital-based maternity settings in the event of PPH following vaginal birth in France, Italy, the Netherlands, and the UK.

Materials and methods

A three-phase Delphi-like method was employed: i) interviews with midwives and survey development, ii) survey completion, iii) multi-professional consensus meeting of midwives and obstetricians/gynaecologists to discuss results.

Survey development

A web-survey was developed following in-depth interviews with two midwives per country (France, Italy, Netherlands, UK) to establish differences in resource use for minor PPH (blood loss 500–1,000 ml) and major PPH (blood loss > 1,000 ml) management versus uncomplicated vaginal birth (no PPH), in a hospital-based maternity setting. Midwives had ≥ 4 years' experience in PPH management. One obstetrician/gynaecologist per participating country reviewed the survey.

Survey completion

The survey was completed by 25 midwives per participating country (March-May 2019) and included a UK pilot phase (n = 4) and main phase (n = 96). Qualified midwives (≥ 2 years' experience) involved in/present during PPH management following vaginal birth in hospital-based maternity settings were eligible. Most midwives had > 5 years' experience (82%) and were hospital-based (70%), although in the Netherlands 88% of participants were independent midwives routinely using hospital facilities for births. Participant characteristics are summarised in Supplementary Table 1.

Consensus meeting

Survey results were validated at a full-day consensus meeting of midwives with ≥ 5 years' experience from Italy (n = 1) and the UK (n = 1) and four obstetricians/gynaecologists (one per participating country) with ≥ 15 years' experience each that were authors of research publications in the field. Advisors discussed whether they agreed with the results and if results reflected clinical practice in their country.

Results

Prevention of PPH

Midwives participating in the survey were asked to estimate what percentage of women receive AMTSL in their hospital-based maternity setting; overall participants estimated that 80% of women receive AMTSL. 93% of participants reported that uterotonics would routinely be used during AMTSL (Supplementary Fig. 1a) and 89% used oxytocin (Supplementary Fig. 1b). Participants provided free-text answers indicating variation between countries in oxytocin dose and administration.

At the consensus meeting, advisors agreed that uterotonics are the key element of AMTSL and agreed with reported doses. While French clinical guidelines recommend the use of 5 or 10 IU oxytocin via slow intravenous (IV) or intramuscular (IM) administration [19], the advisor from France reported that 5 IU (IV) oxytocin would routinely be used. The advisor from the Netherlands noted that 5 IU (IM) is preferred in the Netherlands, supported by national clinical guidelines [21]. In Italy and the UK, advisors reported that 10 IU (IM) oxytocin was routinely used, as recommended in national guidelines [20,22].

Diagnosis of PPH

Early diagnosis of PPH is an essential first step to decrease morbidity and mortality [32]. The UK Royal College of Obstetricians and Gynaecologists (RCOG) guidelines acknowledge that visual estimation of blood loss is inaccurate and clinical signs should be included for PPH assessment [33]. The Collège National des Gynécologues et Obstétriciens Français guidelines recommend routine use of a collection bag for assessment of blood loss [19]. In total, 84% of survey participants stated blood loss is routinely measured in their hospital (France 100%; Italy 96%; Netherlands 64%; UK 76%). These participants further indicated the methods they routinely used to assess blood loss (Table 1). Results revealed the use of a combination of methods, including objective measurement of blood loss with collection bags and/or weighing methods (93% of participants), as well as visual estimation as an initial method to rapidly assess PPH severity (65.5% of participants), often in combination with objective measures. Remaining participants (16%) reported that, in their practice, blood loss is estimated and only measured if deemed necessary.

Advisors at the consensus meeting stated that the method used to assess blood loss may influence the number of PPH cases diagnosed. Importantly, visual estimation may underestimate blood

Table 1
Methods used for the assessment of blood loss for PPH diagnosis in hospitals that routinely measure blood loss.

Routine measurement of blood loss	Overall (n = 84)	France (n = 25)	Italy (n = 24)	Netherlands (n = 16)	UK (n = 19)
Visual estimation/ personal experience – no. (%)	55 (65.5)	11 (44)	14 (58.3)	13 (81.3)	17 (89.5)
Collection bag – no. (%)	51 (60.7)	24 (96)	22 (91.7)	1 (6.3)	4 (21.1)
Weighing methods – no. (%)	50 (59.5)	14 (56)	7 (29.2)	16 (100)	13 (68.4)
Clinical signs – no. (%)	45 (53.6)	16 (64)	10 (41.7)	7 (43.8)	12 (63.2)

Note, survey participants could select > 1 method for assessment of blood loss. This question was only answered by survey participants that selected "Yes" in response to the question "Would blood loss be routinely measured in your hospital?".

loss [33–37]. Advisors considered that increased use of objective methods of measurement may increase the rate of diagnosed PPH cases and enables earlier diagnosis and treatment.

Medical interventions

Uterotonic drugs are used for both prevention of PPH due to uterine atony and for PPH treatment if bleeding continues. Advisors at the consensus meeting highlighted that increased speed and severity of bleeding is the trigger to administer additional uterotonics. However, the transition from prevention to treatment of PPH is not always clear.

Overall, 84% of participants reported that additional uterotonics would be administered for minor PPH treatment, increasing to 92% for major PPH. Oxytocin is most commonly used, with variation in the use of other uterotonics between countries (Fig. 1). Advisors agreed that oxytocin would be the first choice in France, Italy, and the Netherlands. In the UK, oxytocin or oxytocin + ergometrine would be the first choice. For second-line treatment, sulprostone would be used in France, ergometrine in Italy, sulprostone or ergometrine in the Netherlands, and carboprost then misoprostol in the UK.

Survey participants selected each medical intervention more frequently for the management of PPH versus no PPH (Fig. 2a). Urinary catheter and IV fluids were most commonly selected. Tranexamic acid was selected by 2% of participants in the absence of PPH, increasing to 17% for minor and 38% for major PPH. Similarly, the number of participants selecting oxygen and blood products increased with PPH occurrence and severity. Advisors were surprised that only 38% of participants reported the use of tranexamic acid for major PPH, and advised that blood products may be used only in 10–15% of the most severe PPH cases.

According to the overall survey results, the median percentage of women requiring surgical management was 39% for major PPH versus 10% for minor PPH. Advisors considered this to be higher than expected and suggested that surgical management, including examination under anaesthesia, may be required in 25% of women for the treatment of major PPH and 5% for minor PPH.

Most participants (85%) stated that all women would be admitted to the postnatal ward for further monitoring, if not discharged home directly from the labour ward. Most interventions used on the postnatal ward were selected more frequently by participants according to PPH occurrence and severity (Fig. 2b). Several participants selected additional uterotonics. At the consensus meeting, advisors commented that while some women may go to the postnatal ward with an oxytocin infusion following PPH, uterotonics would not usually be administered to women in this setting.

Healthcare personnel

Most participants (97%) identified that the midwife is the primary caregiver for births, with 3% reporting that an obstetrician/gynaecologist is the primary caregiver.

Participants indicated that midwives generally provide continuous care (1:1 care with continuous monitoring), and the number is similar regardless of PPH occurrence/severity (Fig. 3a). A similar number of healthcare assistants are involved during PPH and no PPH, however care is more likely to be continuous if PPH occurs. Regarding nurses, obstetricians/gynaecologists, and anaesthetists, the number involved increases with the occurrence and severity of PPH, as well as the proportion providing continuous care. In addition to providing care to the mother, advisors from France, Italy, and the Netherlands stated that a nurse may be required to care for the baby if the mother requires transfer to the ICU.

Although there remains a risk of further bleeding when women are transferred to the postnatal ward, fewer personnel are involved in care (Fig. 3b). Obstetricians/gynaecologists and anaesthetists mainly provide intermittent care on the postnatal ward, increasing according to PPH severity. Surprisingly, the mean number of midwives, healthcare assistants, and nurses involved in care on the postnatal ward was not reported to increase with PPH rates. Advisors at the consensus meeting proposed as an explanation that women may receive a longer period of dedicated 1:1 care from a midwife following PPH and more time with an obstetrician/gynaecologist, whereas women who have not had a PPH may receive care from any available midwife, equating to care from more midwives but less time overall. In addition, advisors from France, Italy, and

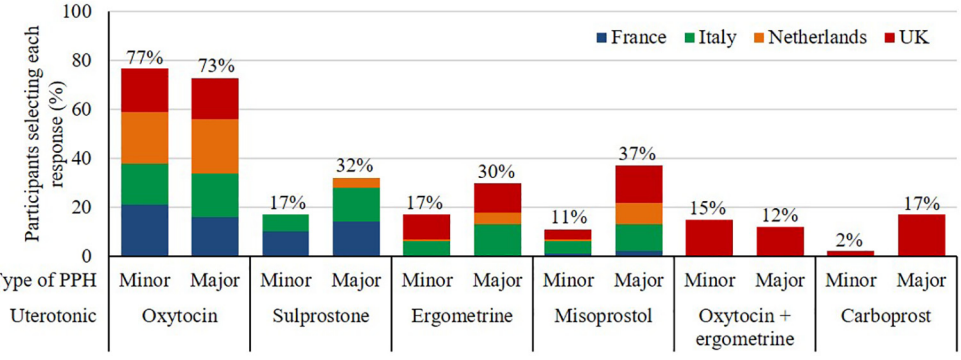

Fig. 1. Administration of additional uterotonics for the treatment of PPH. Note, survey participants could select > 1 uterotonic.

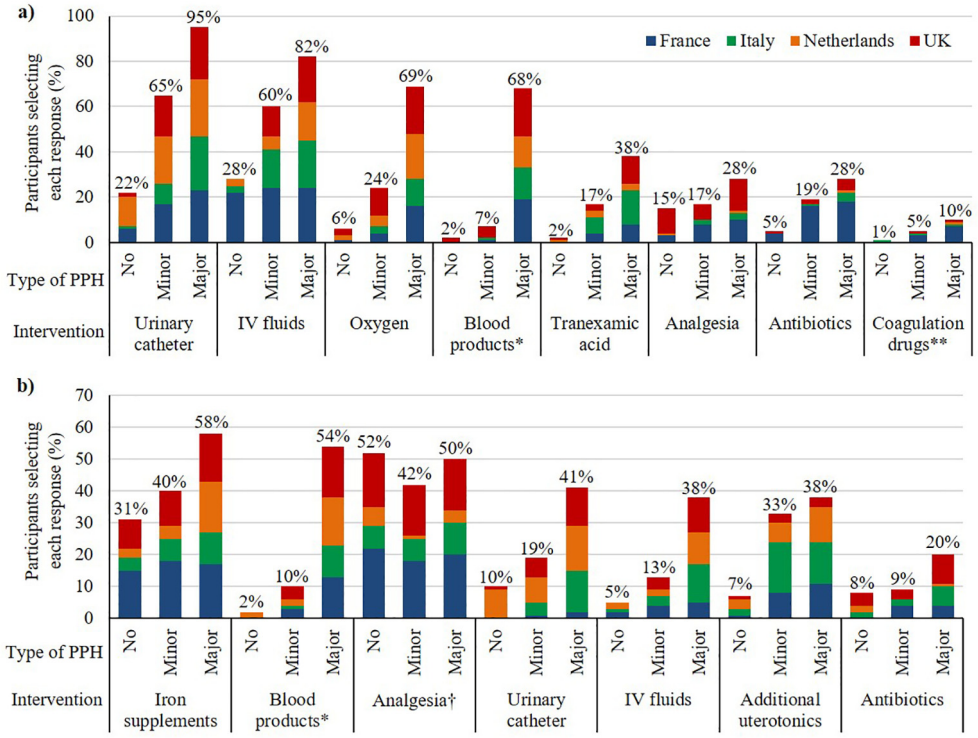

Fig. 2. Medical interventions used a) during the third stage of labour (no PPH) and for the management of PPH and b) on the postnatal ward.
Note, survey participants could select > 1 medical intervention.
*Blood products given for transfusion (for example red blood cells).
**Coagulation drugs slow down the breakdown of blood clots, which helps to prevent prolonged bleeding.
†Paracetamol and ibuprofen were the most frequently reported analgesics used.

the Netherlands highlighted that a psychologist/social worker may be involved in care following major PPH.

Time in hospital

Participants were asked to estimate the proportion of women going to each hospital department. Results were used to calculate total time in hospital, based on time spent in each department (Supplementary Table 2). Variation between countries was observed (Table 2), reflecting differences in healthcare systems. Advisors confirmed that there were variations in services in individual hospitals (e.g. not all hospitals have an ICU), therefore the total time in hospital was most representative. In agreement with overall survey findings, advisors acknowledged that women would spend approximately 24 h longer in hospital for major versus no PPH.

Discussion

This study provides information on HCRU during the third stage of labour and treatment of PPH following vaginal birth in hospital-based maternity settings in France, Italy, the Netherlands, and the UK.

As expected, most participants (93%) said that uterotonics would be used for PPH prevention. Of the 7% of midwives that would not routinely administer uterotonics, these midwives may be involved in the care of low-risk births, with a preference for physiological management of the third stage of labour; furthermore, some women may choose not to receive a uterotonic. This survey highlights that not all women receive uterotonics, despite the WHO and clinical guidelines from the four participating countries recommending the systematic use of uterotonics for the prevention of PPH [9,19–22,33]. Oxytocin was the most commonly used prophylactic uterotonic in all countries. A high proportion of UK participants also stated oxytocin + ergometrine would be used, as reported in previous studies [26–28]. However, oxytocin + ergometrine is associated with risk of hypertension and has been linked to shock, collapse, coronary artery spasm, and myocardial infarction [38].

This study found that HCRU increases with PPH occurrence and severity, including additional medical interventions, healthcare personnel, and more time spent in hospital.

In line with previous publications, we found that the use of medical interventions increased with the occurrence and severity of PPH, such as urinary catheter, IV fluids, blood products, tranexamic acid, and administration of additional uterotonics. Van der Nelson et al. [30] published an economic impact analysis of oxytocics (carbetocin and oxytocin) used for PPH prevention at caesarean section where there was a similar increase in resource use linked to PPH severity, including additional uterotonics and blood products. However, this was a small study using data from one UK hospital.

Although reported tranexamic acid use increased with occurrence and severity of PPH in our survey, the results highlight a paucity in its use for the management of PPH. Advisors were surprised that only 38% of participants selected its use for major PPH, despite the availability of published data showing that tranexamic acid reduces the risk of maternal death due to haemorrhage [39]. Advisors considered that the survey results were overestimated for the percentage of women requiring surgical management and estimated that this would be required in 10% and 25% of cases of minor and major PPH, respectively. Surgical intervention may be reduced by the involvement of senior colleagues at an early stage in PPH management.

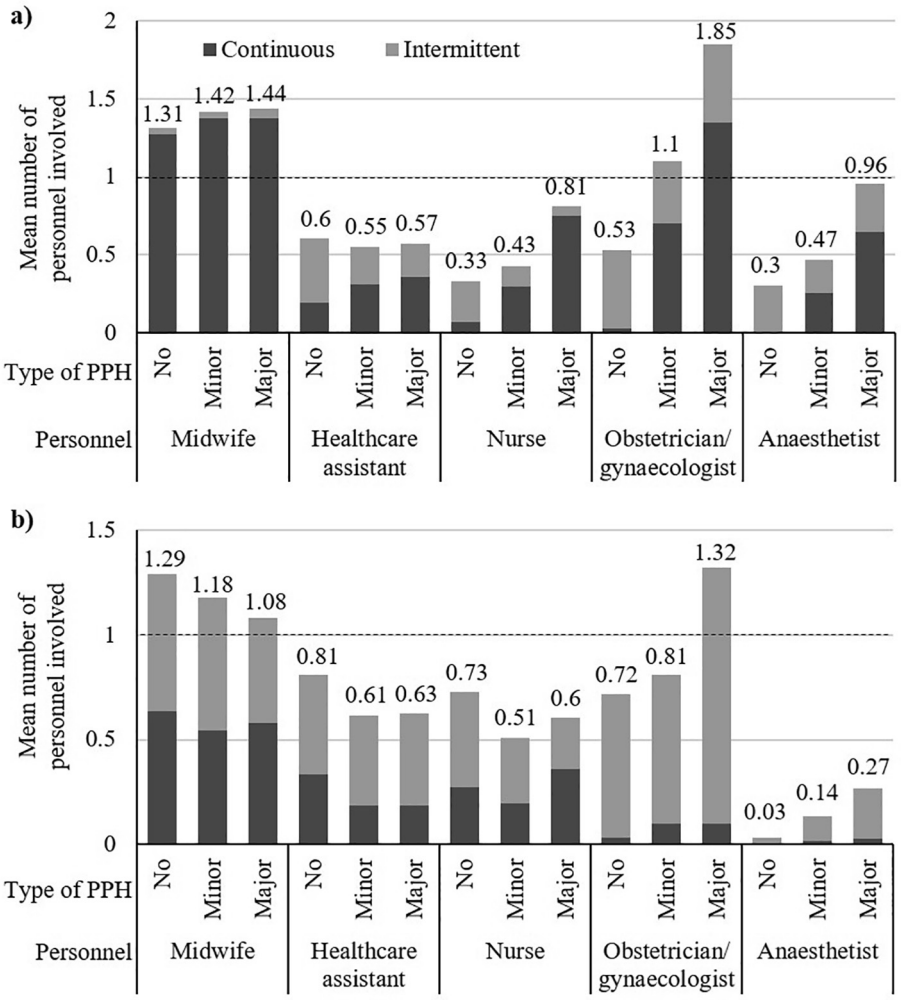

Fig. 3. Healthcare professionals involved in care a) during the third stage of labour (no PPH) or PPH and b) on the postnatal ward. The mean number of personnel was calculated by adding up the number of each personnel estimated by each respondent and dividing by the total number of respondents from the main phase of the survey (n = 96). The proportion of personnel providing continuous and intermittent care was calculated according to the proportion of participants stating that care would be continuous or intermittent.

Table 2
Total time (days) spent in hospital following no PPH, minor PPH, and major PPH.

Time in days	Overall	France	Italy	Netherlands	UK
No PPH	2.2	3.5	2.8	0.7	1.3
Minor PPH	2.4	4.0	3.0	0.8	1.9
Major PPH	3.2	4.5	3.6	1.5	3.6
Major PPH versus no PPH	+1.0	+1.0	+0.8	+0.8	+2.3

Survey participants were asked the proportion of women that would be transferred to each hospital department, and how long they would spend there. Total time in hospital was calculated as a sum of the time spent in each department. Breakdown of the overall results is provided in Supplementary Table 2.

Overall, our results indicate that more healthcare professionals are involved in the care of women during PPH compared to uncomplicated birth (no PPH). The number of staff involved increases with PPH severity, and care is more likely to be continuous. This is in agreement with a previous study, which reported that additional time from midwives, obstetricians, junior doctors, anaesthetists, and haematologists is required following blood loss $\geq$ 1,500 ml [30]. UK RCOG guidelines recommend continuous physiological monitoring for major PPH [33].

At the consensus meeting, advisors from France and Italy recommended the involvement of a psychologist on the postnatal ward for women who have experienced major PPH. It has been reported that most women in a French tertiary obstetric centre would be offered psychological support following severe PPH [12]. A study in the Netherlands found that women attended follow-up appointments with a psychologist (16%), social worker (10%), or psychiatrist (4%); of the women who did not receive counselling, 25% said that they would have benefitted from this service [40]. Routinely offering psychological support to women following PPH could help prevent long-term psychological morbidity.

In this study, country differences were observed for the time spent in hospital. Notably, women in the Netherlands spend the least time in hospital. Most survey participants from the Netherlands were independent midwives routinely using hospital facilities for births but also providing care at home (88%;

Supplementary Table 1). Postnatal maternity care is provided in the Netherlands; women receive up to 49 h of care at home from a maternity nurse for eight days post-birth [41]. Overall, major PPH is associated with an additional day in hospital versus no PPH, which all advisors agreed with, and is supported by previously published data [30,31]. As our survey results indicate that not all women receive uterotonics for PPH prevention, despite the recommendations of the WHO and guidelines from the four participating countries [9,19–22,33], consistent use of uterotonics during AMTSL should be emphasised by healthcare providers to reduce the occurrence of major PPH and prolonged hospital stays.

To our knowledge, this study is the first to compare HCRU during PPH management with uncomplicated vaginal birth in European countries. The study was designed to collate information at several levels including initial insights from in-depth interviews with midwives (n = 8), surveying a larger sample of midwives (n = 100), and final consensus with obstetricians and midwives (n = 6).

Limitations of the study include potential survey responder bias as midwives were asked to report their own experiences; reporting of patient-level data were beyond the scope of the study. The survey sample size was limited to 25 participants per country, so the results may not be representative of all maternity settings within a country. The multi-professional consensus meeting aimed to mitigate the impact of these limitations, allowing the opportunity for discussion of survey results and consideration of their representativeness; it is however limited by the small sample size. Future studies could perform analyses using hospital records to further assess the HCRU associated with PPH management.

Conclusion

This study highlights the increased HCRU with both PPH occurrence and severity. As rates of PPH caused by uterine atony are increasing in many developed countries, prevention with effective uterotonics is key to reducing HCRU and costs associated with PPH treatment, and most importantly, improving care for women and their families.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. G.H.H. and K.K. disclose that they are employees of GENESIS Research, a company that received funding from Ferring Pharmaceuticals for its role in conducting the study and developing the manuscript. J.R. was employed by GENESIS Research at the time the study was conducted. Y.L.Y.S. is employed by Ferring Pharmaceuticals, the sponsor of this study. J.P. was employed by Ferring Pharmaceuticals at the time the study was conducted. M.C.A., I.C., T.D., T.H., and G.H.A.V. received payment from Ferring Pharmaceuticals for consultancy during the study and development of the manuscript. C.W. has no potential conflicts of interest with respect to the research, authorship, and/ or publication of this article.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ejogrb.2021.11.432.

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Jessica Richardson: Dr Jessica Richardson obtained a Bachelor of Science (Honours) in Biomedical Sciences and Master of Research in Mitochondrial Biology and Medicine at Newcastle University. Following this, she completed a laboratory-based PhD in Developmental and Cell Biology at the Institute of Genetic Medicine, Newcastle University. Dr Richardson started her career as a medical writer/ life science research analyst in 2017. As a medical writer, she conducts desk-based research and develop reports and publications across various disease areas.

Georgia Hollier-Hann: Dr Georgia Hollier-Hann has a BSc in Biological Sciences with Honours in Infectious Diseases from the University of Edinburgh and a PhD and MRes in Molecular Microbiology from Newcastle University. She has worked for a market access consultancy in the pharmaceutical industry since 2017. In her role, Dr Hollier-Hann regularly leads research projects to collect and synthesise evidence from published sources, key opinion leaders, and clinical experts, and develops reports, reviews, and publications. She has experience in a variety of disease areas including obstetrics and gynaecology, haematology, metabolic disorders, neurology, and oncology.

Kathryn Kelly: Dr Kathryn Kelly obtained a Bachelor of Medicine and Bachelor of Surgery, MBBS from Newcastle University in 2013. She has 4 years of experience working as a medical doctor in the UK National Health Service, where she rotated through a range of clinical specialities, starting speciality training in histopathology in 2015. Dr Kelly began her career as a medical writer / life science research analyst in 2017, where she has been involved in the research and development of reviews and reports to support market access in the pharmaceutical industry in a range of disease areas.

Maria Chiara Alvisi: Maria Chiara Alvisi is a mother of two children and has been an independent midwife since 2013. After her studies in the biggest maternity centres of Milan, she began her work near women outside hospitals. Her aim is to accompany women and families through pregnancy, birth, and taking care of the baby, and to let them live this time in a positive, informed, and conscious way. Discovering the great vastness of possible choices during birth is the first step to choose what is the best way for us and for our baby to arrive in this world safe and joyful.

Cathy Winter: Dr Cathy Winter is a Senior Midwife at North Bristol NHS Trust, UK and is the lead midwife for the PROMPT Maternity Foundation. She works with a multi-professional team to distribute an obstetric emergencies training package, PROMPT, to maternity units throughout the UK and globally. Dr Winter has extensive research experience, aiming to influence clinical practice by making evidence-based tools available to support maternity staff in providing the best care for mothers and babies. In 2017, she was awarded an honorary doctorate from the University of the West of England for her contributions to maternity services nationally and internationally.

Irene Cetin: Dr Irene Cetin is a Professor of Obstetrics and Gynecology and Head of the Maternal-Fetal Translational Research "Giorgio Pardi" Laboratory in the Dept. Biomedical and Clinical Sciences, University of Milan, Italy. She is Chairman of the Obstetrics and Gynecology Unit at Hospital V.Buzzi. Dr Cetin has coordinated nationally- and European-funded research studying human pregnancy and placental function, including pathologies such as preeclampsia and gestational diabetes. She has expertise in maternal and fetal nutrition and is involved in programs for prevention of maternal and perinatal diseases. Her research activities contributed to >600 publications, including >30 book chapters and 300 original articles.

Timothy Draycott: Professor Tim Draycott is a Consultant Obstetrician at North Bristol NHS Trust and the University of Bristol, UK. He has led an academic department in Obstetrics and Gynaecology at North Bristol for 15 years, recognised as a world-leading international intrapartum and safety research centre. Professor Draycott has a research interest in patient safety, quality improvement, and multi-professional obstetric training, and has led large, multi-centre randomised controlled trials and national-level trials. He co-leads the PROMPT training programme, implemented in >45 countries; is senior clinical advisor to NHS Resolution, UK; and Vice President of the Royal College of Obstetricians and Gynaecologists Council.

Thierry Harvey: Dr Thierry Harvey is the Head of the Maternity Department at the Groupe Hospitalier Diaconesses Croix Saint-Simon, Paris, France. He has worked at this leading French obstetrics unit since 1994, which oversees approximately 2,600 births per year. A keen blues guitarist, Dr Harvey is also involved in teaching labour ward procedures and is President of the Parisian perinatal network.

Gerard H. A. Visser: Gerard Visser is an emeritus Professor of Obstetrics at University Medical Center, Utrecht, The Netherlands. After retirement he became president of the European Association of Perinatal Medicine and chair of FIGO's committee Safe Motherhood and Newborn Health. He is Honorary Fellow of the Flemish, South African and Royal (British) Colleges of Obstetrics and Gynecology. Professor Visser's research interests include foetal neurological development, foetal monitoring, intrauterine growth restriction, diabetes and pregnancy, and caesarean section and its complications. His research activities have contributed to >480 Pubmed publications.

Yum L. Yip Sonderegger: Dr Yum Lina Yip Sonderegger started her career working in academia, focusing on cancer research and bioinformatics. She continued her career in the pharmaceutical industry, with global roles in R&D knowledge management, and commercial business evaluation across various disease areas. Dr Yip Sonderegger's current career focus is on Market Access, where she leverages her experience from both R&D and commercial sides to ensure the development of value-added products to address the unmet needs of patients, while meeting the requirement of key stakeholders. She has a PhD in Medicine (Molecular Oncology), an MSc in Bioinformatics, and an executive MBA.

Julie Perroud: Dr Julie Perroud is a Biochemist by training. She obtained her PhD diploma in 2016 on the topic of human muscular stem cell differentiation. With the willingness to bring concrete treatments to patients, her career evolved from academic research to the pharmaceutical industry. Dr Perroud worked within Ferring Pharmaceuticals headquarters from 2017 to 2020, in Medical Affairs and Market Access functions. She is now pursuing her career as Medical Science Liaison at another pharmaceutical company.