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Recognition and management of persistent postpartum haemorrhage: Time to take timing seriously

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List of publications

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McCall SJ, **Henriquez DDCA**, McKinnon Edwards H, Van den Akker T, Van der Bom JG, Bonnet MP, Deneux-Tharaux C, Donati S, Gillissen A, Kurinczuk JJ, Li Z, Maraschini A, Seco A, Sullivan E, Stanworth S, Knight M on behalf of the INOSS collaboration. A total blood volume or more transfused during pregnancy or after childbirth: individual patient data from six international population-based observational studies. *Submitted.*

Henriquez DDCA, Bloemenkamp KWM, van der Bom JG. Management of postpartum hemorrhage: how to improve maternal outcomes? [published online ahead of print, 2018 Jun 8]. *J Thromb Haemost*. 2018;10.1111/jth.14200. doi:10.1111/jth.14200

Henriquez DDCA, Gillissen A, Smith SM, Cramer RA, Van den Akker T, Zwart JJ, Van Roosmalen JJM, Bloemenkamp KWM, Van der Bom JG. Clinical characteristics of women captured by extending the definition of severe postpartum haemorrhage with 'refractoriness to treatment': a cohort study. *BMC Pregnancy Childbirth*. 2019;19(1):361. Published 2019 Oct 17. doi:10.1186/s12884-019-2499-9

Henriquez DDCA, Van Goeverden RJ, Bloemenkamp KWM, Van Lith JMM, Zwart JJ, Van Roosmalen JJM, Van der Bom JG. Hypertensive disorders of pregnancy and outcomes of persistent postpartum haemorrhage: a cohort study. *Submitted.*

Henriquez DDCA, Bloemenkamp KWM, Loeff RM, Zwart JJ, Van Roosmalen JJM, Zwaginga JJ, Van der Bom JG. Fluid resuscitation during persistent postpartum haemorrhage and maternal outcome: A nationwide cohort study. *Eur J Obstet Gynecol Reprod Biol*. 2019;235:49–56. doi:10.1016/j.ejogrb.2019.01.027

Henriquez DDCA, Caram-Deelder C, Le Cessie S, Zwart JJ, Van Roosmalen JJM, Eikenboom HCJ, So-Osman C, Van de Watering LMG, Zwaginga JJ, Koopman-van Gemert AWMM, Bloemenkamp KWM, Van der Bom JG. Association of Timing of Plasma Transfusion With Adverse Maternal Outcomes in Women With Persistent Postpartum Hemorrhage. *JAMA Netw Open*. 2019;2(11):e1915628. Published 2019 Nov 1. doi:10.1001/jamanetworkopen.2019.15628

Henriquez DDCA, Van der Bom JG. The best timing of tranexamic acid administration for bleeding after trauma or childbirth remains to be established. *Submitted.*

Other

Laureij LT, Been JV, Lugtenberg M, Ernst-Smelt HE, Franx A, Hazelzet JA, De Groot PK, Frauenfelder O, **Henriquez D**, Lamain-de Ruiter M, Neppelenbroek E, Nij Bijvank SWA, Schaap T, Schagen M, Veenhof M, Vermolen JH. Exploring the applicability of the pregnancy and childbirth outcome set: A mixed methods study [published online ahead of print, 2019 Sep 26]. *Patient Educ Couns*. 2019;S0738-3991(19)30430-6. doi:10.1016/j.pec.2019.09.022

Ramler PI, **Henriquez DDCA**, van den Akker T, Caram-Deelder C, Groenwold RHH, Bloemenkamp KWM, Van Roosmalen JJM, Van Lith JMM, Van der Bom JG. Comparison of outcome between intrauterine balloon tamponade and uterine artery embolization in the management of persistent postpartum hemorrhage: A propensity score-matched cohort study. *Acta Obstet Gynecol Scand*. 2019;98(11):1473–1482. doi:10.1111/aogs.13679

Gillissen A, van den Akker T, Caram-Deelder C, **Henriquez DDCA**, Nij Bijvank SWA, Bloemenkamp KWM, Eikenboom HCJ, Van der Bom JG. Predictive value of a bleeding score for postpartum hemorrhage. *Res Pract Thromb Haemost*. 2019;3(2):277–284. Published 2019 Apr 4. doi:10.1002/rth2.12194

Gillissen A, van den Akker T, Caram-Deelder C, **Henriquez DDCA**, Bloemenkamp KWM, Eikenboom HCJ, Van der Bom JG, De Maat MPM. Comparison of thromboelastometry by ROTEM® Delta and ROTEM® Sigma in women with postpartum haemorrhage. *Scand J Clin Lab Invest*. 2019;79(1-2):32–38. doi:10.1080/00365513.2019.1571220

Ramler PI, van den Akker T, **Henriquez DDCA**, Zwart JJ, Van Roosmalen JJM, Van Lith JMM, Van der Bom JG. Women receiving massive transfusion due to postpartum hemorrhage: A comparison over time between two nationwide cohort studies. *Acta Obstet Gynecol Scand*. 2019;98(6):795–804. doi:10.1111/aogs.13542

Gillissen A, van den Akker T, Caram-Deelder C, **Henriquez DDCA**, Bloemenkamp KWM, Van Roosmalen JJM, Eikenboom HCJ, Van der bom JG. Association between fluid management and dilutional coagulopathy in severe postpartum haemorrhage: a nationwide retrospective cohort study. *BMC Pregnancy Childbirth*. 2018;18(1):398. Published 2018 Oct 11. doi:10.1186/s12884-018-2021-9

Gillissen A, van den Akker T, Caram-Deelder C, **Henriquez DDCA**, Bloemenkamp KWM, De Maat MPM, Van Roosmalen JJM, Zwart JJ, Eikenboom HCJ, Van der Bom JG. Coagulation parameters during the course of severe postpartum hemorrhage: a nationwide retrospective cohort study. *Blood Adv*. 2018;2(19):2433–2442. doi:10.1182/bloodadvances.2018022632

Gillissen A, **Henriquez DDCA**, van den Akker T, Caram-Deelder C, Wind M, Zwart JJ, Van Roosmalen JJM, Eikenboom HCJ, Bloemenkamp KWM, Van der Bom JG. The effect of tranexamic acid on blood loss and maternal outcome in the treatment of persistent postpartum hemorrhage: A nationwide retrospective cohort study. *PLoS One*. 2017;12(11):e0187555. Published 2017 Nov 6. doi:10.1371/journal.pone.0187555

Ramler PI, van den Akker T, **Henriquez DDCA**, Zwart JJ, van Roosmalen J. Incidence, management and outcome of women requiring massive transfusion after childbirth in the Netherlands: secondary analysis of a nationwide cohort study between 2004 and 2006. *BMC Pregnancy Childbirth*. 2017;17(1):197. Published 2017 Jun 19. doi:10.1186/s12884-017-1384-7

Henriquez DDCA, Roos-Hesselink JW, Schalij MJ, Klautz RJ, Helmerhorst FM, de Groot CJ. Treatment of valvular heart disease during pregnancy for improving maternal and neonatal outcome. *Cochrane Database Syst Rev*. 2011;(5):CD008128. Published 2011 May 11. doi:10.1002/14651858.CD008128.pub2

Henriquez DDCA, van Dongen H, Wolterbeek R, Jansen FW. Polypectomy in premenopausal women with abnormal uterine bleeding: effectiveness of hysteroscopic removal. *J Minim Invasive Gynecol*. 2007;14(1):59–63. doi:10.1016/j.jmig.2006.07.008

Curriculum Vitae

Dacia Henriquez was born on the 25th of September, 1981, in Curaçao. She attended the secondary school Maria Immaculata Lyceum in Willemstad, Curaçao, and graduated cum laude in 1999. She moved to Leiden, the Netherlands, for her medical training at the Leiden University Medical Center, and from 2006 to 2009, she worked as a medical doctor at the Department of Obstetrics & Gynaecology of the Medical Center Haaglanden in The Hague. In 2009 she started the Residency Program Obstetrics & Gynaecology in the Medical Center Haaglanden (Dr. M.J. Kagie) and Leiden University Medical Center (Prof. Dr. J.M.M. van Lith). She discontinued her residency in 2012 to work on her PhD project at the Center for Clinical Transfusion Research (Sanquin Research Leiden) and the LUMC Department of Clinical Epidemiology and Department of Obstetrics & Gynaecology (Prof. Dr. J.G. van der Bom and Prof. Dr. K.W.M. Bloemenkamp). During her PhD program, she set up and coordinated the nationwide *Transfusion strategies in women with Major Postpartum Haemorrhage* (TeMpOH-1) study, and she supervised the scientific internship of ten medical students. She was also closely involved in the conduction of the TeMpOH-2 study and supervised the TeMpOH-3 study. From 2015 to 2019, she continued her clinical training in Obstetrics & Gynaecology at the Leiden University Medical Center and the HagaZiekenhuis in The Hague (Dr. B.W.J. Hellebrekers). After her residency she worked as an Obstetrician at the Spaarne Gasthuis in Haarlem & Hoofddorp. In January 2021, she will start a fellowship in Maternal Fetal Medicine at the Amsterdam University Medical Center.

Dacia is married to Dinomar and they live with their three children Emme (2012), Marcus (2016) and Maxime (2020) in The Hague.