able to quantify her daily fluid intake using a mobile phone application (app) called Plant Nanny. Within this app you can create a plant that keeps you company every day by 'living' in your telephone. In order to keep it alive and help it grow, you must give it water regularly and this is a very simple and pleasant way to encourage someone to drink more fluid and record intake. Similar apps are Daily Water, Hydro Coach, Waterlogged and iHydrate.

We can also recommend such an app for NHS staff. The Association of Anaesthetists has published guidelines 'Fatigue and Anaesthetists' which recommends using electronic devices to facilitate maintaining a diary of activity and sleep.[4] They also suggest avoiding dehydration as one of the coping mechanisms to prevent fatigue. Having an app that encourages us to stay hydrated could be one step forward in taking care of our wellbeing.

Declaration of interest

None.

E. Werpachowska, S. Quasim
Anaesthetics Department, University Hospitals Coventry and Warwickshire NHS Trust, Coventry, United Kingdom
E-mail address: ewer@doctor.com

References

1. Kanjwal Y, Kosinski D, Grubb BP. The postural orthostatic tachycardia syndrome: Definitions, diagnosis, and management. *Pacing Clin Electrophysiol* 2003;**26**:1747–57.
2. Thieben MJ, Sandroni P, Sletten DM, et al. Postural orthostatic tachycardia syndrome: the Mayo clinic experience. *Mayo Clin Proc* 2007;**82**:308–13.
3. PoTS UK, Postural Tachycardia Syndrome (PoTS and Pregnancy). Available at: http://www.potsuk.org/UserFiles/File///pregnancy_and_PoTS_v5_2017.pdf. Accessed September 12, 2018.
4. The Association of Anaesthetists of Great Britain and Ireland, Fatigue and Anaesthetists. Available at: https://www.aagbi.org/sites/default/files/Fatigue%20Guideline%20web.pdf. Accessed September 12, 2018.

0959-289X/$ - see front matter

https://doi.org/10.1016/j.ijoa.2018.10.001

Blood pressure measurement in pregnancy

We refer to the article on blood pressure measurement in obese pregnant women in the August edition of IJOA.[1] On page 68, the statement is made that four devices are currently validated for blood pressure measurement in pre-eclampsia. However, the article in the Journal of Hypertension to which the authors refer, also includes as validated the Microlife 3AS1-2 device, which appears to have not been referenced in the article.

The Microlife 3AS1-2 device (now known as the Cradle VSA device, with an inbuilt traffic light system and shock detection) has been validated in accordance with the British Hypertension Society protocol requirements and achieved the International Organisation for Standardization standard for mean difference ± SD (≤5 ± 8 mmHg) in pregnancy, including in pre-eclampsia.[1] Thus, it can be recommended for use in pregnancy and may be particularly useful for accurate detection of blood pressure in high-risk women with pre-eclampsia, where impaired accuracy of other automated devices at higher blood pressures mean that they may underestimate the true blood pressure.[2] It can be used with both small and large cuff sizes.

In addition, the Cradle VSA has been specifically designed for use in low-resource settings, where healthcare workers have limited access to accurate vital signs measuring devices that are suitable for their environment. Over 20 000 such devices have been rolled out in over 20 low- and middle-income countries recently. The device is low cost, easy to use, has low power requirements and can be charged using a standard mobile phone charger. It is also robust and remains very accurate, even at extremes of temperature and humidity.[2] Its integrated traffic light early warning system can identify women who are hypertensive and at increased risk of complications, and who thus require referral and transfer to higher level care.[3]

The device's validation in pregnant women with low blood pressure means that it may also improve the detection of shock, secondary to obstetric haemorrhage or sepsis, particularly in a low-resource setting.[4]

The Cradle VSA device is the cheapest and most accurate blood pressure device available for use in pregnancy and has been recognised as one of the top thirty high impact innovations in global health.[5]

A discussion regarding blood pressure measurement in pregnant women would, therefore, not be complete without mention of this innovative device that has the potential to dramatically improve both maternal and neonatal outcomes around the world.

A. Beardmore Gray
Guy's and St Thomas' Hospital, London, United Kingdom
E-mail address: alice.1.beardmore-gray@kcl.ac.uk

R. Dyer
Department of Anaesthesia and Perioperative Medicine University of Cape Town, South Africa

A. Shennan
Department of Women's Health, King's College London United Kingdom

References

1. Eley VA, Christensen R, Kumar S, Callaway LK. A review of blood pressure measurement in obese pregnant women. *Int J Obstet Anesth* 2018;**35**:64–74.
2. Nathan HL, de Greeff A, Hezelgrave N, Chappell L, Shennan A. An accurate semi-automated oscillometric blood pressure (BP) device for use in pregnancy in a low- and middle-income country population: the Microlife 3AS1-2. *Blood Press Monit* 2014;**20**:52–5.
3. Nathan HL, Seed PT, Hezelgrave NL, et al. Early warning system hypertension thresholds to predict adverse outcomes in pre-eclampsia: a prospective cohort study. *Pregnancy Hypertens* 2018;**12**:183–8.
4. Nathan HL, De Greef A, Hezelgrave N, Chappell L, Shennan A. Accuracy validation of the microlife 3AS1-2 blood pressure device in an African pregnant population with low blood pressure. *Blood Press Monit* 2015;**20**:299–302.
5. Nathan HL, Vousden N, Lawley E, et al. Development and evaluation of a novel Vital Signs Alert device for use in pregnancy in low-resource settings. *BMJ Innovations* 2018;**4**:192–8.

0959-289X/$ - see front matter

https://doi.org/10.1016/j.ijoa.2018.11.006

In reply

We thank you for your interest in our article.[1] We agree that the ability to accurately measure blood pressure in low-, medium- and high-resource settings is crucial. It is also important to be able to measure both low and high blood pressure accurately. On page 67 of the published manuscript[1] we state that "...five of 14 of the devices intended for clinic use (as opposed to home blood pressure monitoring use) were validated according to approved protocols and were without protocol violations." This is a citation of the 2018 paper by Bello et al.[2] which was published in the journal Hypertension.

Consistent with our citation, Bello et al.[2] concluded that the validation process applied in the manuscripts published by Nathan et al.[3,4] contained minor protocol violations, which they define in their online supplementary materials. For these studies, they attributed the minor protocol violations to the systolic and diastolic blood pressure ranges.

The purpose of describing the findings of Bello et al.[2] in our manuscript was to highlight the difficulties faced in validating blood pressure measurement devices in pregnant women, even before the issues of obesity and very large arm circumference are considered. We did not intend to list all the devices evaluated by Bello et al.[2]

As the title suggests, our manuscript is a review of blood pressure measurement in obese pregnant women. The Microlife 3AS1-2™ was validated in women with an arm circumference of up to 36 cm (in women with low blood pressure[4]) and in women with a mean arm circumference of 31 cm (including women with preeclampsia, no range or standard deviation published). It is therefore reasonable that this device was not a focus of our review.

V. Eley, R. Christensen
Department of Anaesthesia and Perioperative Medicine The Royal Brisbane and Women's Hospital and The University of Queensland, Faculty of Medicine, Brisbane Queensland, Australia
E-mail address: v.eley@uq.edu.au

S. Kumar
Mater Research Institute and Department of Maternal Fetal Medicine, The Mater Mothers' Hospital, Brisbane Queensland, Australia

L. Callaway
The University of Queensland, Faculty of Medicine and Department of Obstetrics and Gynaecology and Obstetric Medicine, The Royal Brisbane and Women's Hospital Brisbane, Queensland, Australia

References

1. Eley V, Christensen R, Kumar S, Callaway L. A review of blood pressure measurement in obese pregnant women. *Int J Obstet Anesth* 2018;**35**:64–74.
2. Bello NA, Woolley JJ, Cleary KL, et al. Accuracy of blood pressure measurement devices in pregnancy. *Hypertension* 2018;**71**:326.
3. Nathan LH, De Greeff LA, Hezelgrave CN, Chappell HL, Shennan HA. An accurate semiautomated oscillometric blood pressure device for use in pregnancy (including pre-eclampsia) in a low-income and middle-income country population: the Microlife 3AS1-2. *Blood Press Monit* 2015;**20**:52–5.
4. Nathan LH, De Greeff LA, Hezelgrave CN, Chappell HL, Shennan HA. Accuracy validation of the Microlife 3AS1-2 blood pressure device in a pregnant population with low blood pressure. *Blood Press Monit* 2015;**20**:299–302.

0959-289X/$ - see front matter

https://doi.org/10.1016/j.ijoa.2018.11.003

Are high-risk obstetric patients properly identified and managed?

Maternal morbidity and mortality are epidemics that are on the rise world-wide, with maternal morbidity and pregnancy-related mortality rates more than doubling in the United States in the last 30 years. The causes are widespread and multivariant, however, before we can address the issue of preventable harm, we must firstly develop a valid measure of assessing and identifying those at risk. Once identified, appropriate triage to higher levels of care or resource allocation can be assessed, to appropriately prepare for potentially complicated deliveries or antepartum or postpartum management. In addition, coordinated care plans specifically designed to address