





Is blood pressure measured correctly in dialysis centres? Physicians' and patients' views

Marco Pappaccogli ^{1,2}, Laura Labriola³, Patricia Van der Niepen⁴, Menno Pruijm⁵, Liffert Vogt⁶, Jean-Michel Halimi^{7,8}, Charles J. Ferro ⁹, Georges Halabi⁵, Olivier Phan⁵, Roberto Bullani⁵, Patrick Saudan¹⁰, Afroditi Avdelidou¹¹, Eleni Panou¹², Fani Papoulidou¹³, Gérard London¹⁴, Patrick Rossignol¹⁵, Pantelis Sarafidis¹⁶, Alexandre Persu ^{2,17,#} and Grégoire Wuerzner ^{5,#}, on behalf of the Working Group 'Hypertension and the Kidney' of the European Society of Hypertension, the Working Group 'European Renal and Cardiovascular Medicine' (EURECA-m) of the European Renal Association–European Dialysis and Transplant Association (ERA-EDTA), the Northern Greece Haemodialysis Network and the F-CRIN INI-CRCT (Cardiovascular and Renal Clinical Trialists) Network

¹Department of Medical Sciences, Division of Internal Medicine and Hypertension Unit, University of Turin, Turin, Italy, ²Division of Cardiology, Cliniques Universitaires Saint-Luc, Université Catholique de Louvain, Brussels, Belgium, ³Department of Nephrology, Cliniques Universitaires Saint Luc, Université Catholique de Louvain, Brussels, Belgium, ⁴Department of Nephrology & Hypertension, Vrije Universiteit Brussel (VUB), Universitair Ziekenhuis Brussel (UZ Brussel), Brussels, Belgium, ⁵Department of Medicine, Service of Nephrology and Hypertension, Lausanne University Hospital, University of Lausanne, Lausanne, Switzerland, ⁶Department of Nephrology, Amsterdam UMC, University of Amsterdam, Amsterdam, The Netherlands, ⁷Centre d'investigation Clinique, INSERM CIC0202, Service de Néphrologie, Centre Hospitalier Universitaire de Tours, Tours, France, ⁸Néphrologie-Immunologie Clinique, Hôpital Bretonneau, CHU Tours, Tours, France, ⁹Department of Renal Medicine, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK, ¹⁰Service of Nephrology, Geneva University Hospitals, Geneva, Switzerland, ¹¹Haemodialysis Unit, General Hospital of Grevena, Grevena, Greece, ¹²Euromedica Hemodialysis Unit, Kozani, Greece, ¹³Hemodialysis Unit, General Hospital of Kavala, Kavala, Greece, ¹⁴Hôpital Manhes and F-CRIN INI-CRCT, Fleury-Mérogis, France, ¹⁵Centre d'Investigations Cliniques Plurithématique Pierre Drouin, INSERM, CHRU de Nancy, Université de Lorraine and F-CRIN INI-CRCT network, Institute Lorrain du coeur et des vaisseaux Louis Mathieu, Nancy, France, ¹⁶Department of Nephrology, Hippokraton Hospital, Aristotle University of Thessaloniki, Greece and ¹⁷Pole of Cardiovascular Research, Institut de Recherche Expérimentale et Clinique, Université Catholique de Louvain, Brussels, Belgium

Correspondence and offprint requests to: Grégoire Wuerzner; E-mail: Gregoire.Wuerzner@chuv.ch; Twitter handle: @ERAEDTA

[#]These authors contributed equally to this work.

Blood pressure (BP) is routinely measured as a vital sign before, during and/or after dialysis (peridialysis BP). Even if peridialytic measurements are widely used, the agreement with the interdialytic BP is poor and is often biased by many technical errors [1]. Since accurate BP measurements are critical for making decisions and evaluating a patient's cardiovascular risk, Working Groups from the ERA-EDTA and the European Society of Hypertension (ESH) issued recommendations on standardized BP measurement in dialysis patients [2]. Previous studies have underlined substantial differences between recommendations for BP measurement in general and effective BP measurements performed by medical staff [3], but whether these recommendations are followed in dialysis centres has not been investigated so far. The objectives of this multi-centric, cross-sectional survey were (i) to assess the adherence to current recommendations [4] on BP measurements in dialysis centres both according to physicians' and patients' perspectives and (ii) to evaluate the use of out-of-office BP measurements in dialysis patients.

In 2017, a call for participation was initially sent to 600 members of the "European Renal and Cardiovascular Medicine Working Group" of the ERA-EDTA and of the 'Hypertension and the Kidney' Working Group of the ESH. Physicians were invited to fill an anonymous questionnaire on their adherence to BP measurement recommendations. In the second part of the survey, questionnaires were then sent to the participating centres in order to collect the same information from both patients and nurses. Only volunteers (physicians, nurses and patients) belonging to a dialysis centre were eligible for the survey. The study was presented to patients by the medical staff and, in case of interest, both filled in questionnaires, and consent forms were collected from volunteers. Approval of the questionnaire by an ethics committee was obtained in countries where it was mandatory according to regulatory rules. Adherence to recommendations on BP measurement in dialysis centres was assessed through two roughly identical questionnaires, one addressed to the physicians and the second to

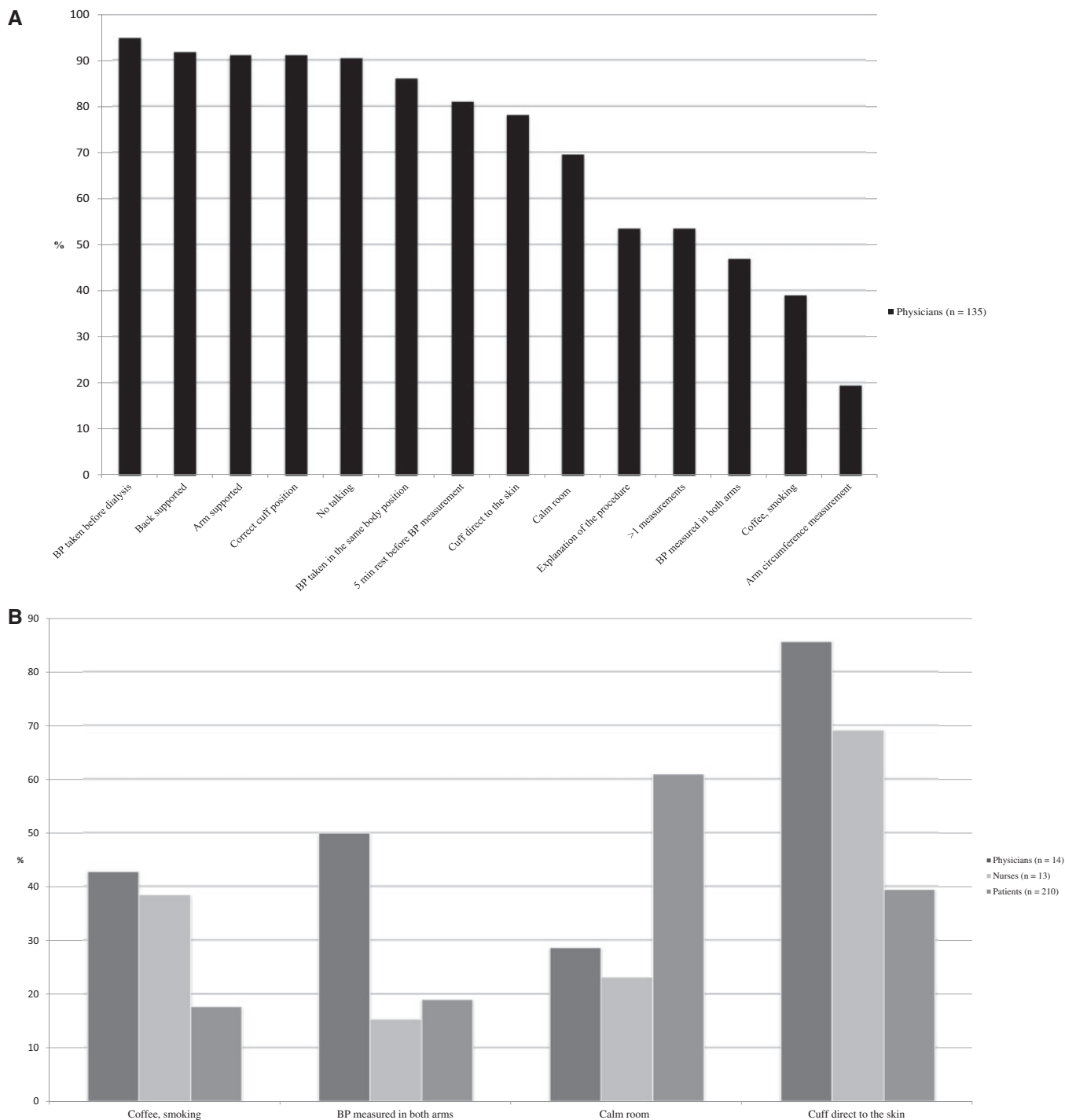


FIGURE 1: Proportion of physicians adhering to different BP measurement recommendations. (A) Physicians' perspective. (B) Comparison between physicians, nurses and patients' perspectives. Only items for which physicians' and patients' assessments were significantly different ($P < 0.05$) are shown.

patients, each consisting of 20 items (14 concerning BP measurement technique and 6 concerning patients' use of out-of-office measurements) (see [Online Supplementary](#)). For each patient, we also collected demographic characteristics, and information on type and duration of dialysis and on the frequency of out-of-office BP measurements. To obtain a quality score, one point was assigned for each correct answer; hence, higher scores indicate a better adherence to recommendations. Statistical analysis was performed using IBM SPSS Statistics version 21.0

(IBM Corp., Armonk, NY, USA). A Chi-square test was used to compare the quality scores between patients' and physicians' assessments, and a Cohen's k test for assessing their agreement. A $P < 0.05$ was considered to be statistically significant.

Ninety-five dialysis centres [92 haemodialysis (HD) and 46 peritoneal dialysis (PD) centres], mostly from Europe (77%), participated in the survey. Physicians were predominantly men (75%) with a mean (\pm SD) age of 51 (\pm 12) years. When considering only the 14 main items, the median (interquartile range)

overall score obtained by the 95 physicians was 10 (10–12) out of 14 items. Interestingly, PD centres showed a higher score than HD centres [11 (10–13) vs 9 (8–11), $P = 0.004$], while no differences were found between university ($N = 60$) and regional centres ($N = 35$) and according to physician's gender or age. Only 36 centres (27%) showed adherence to at least 80% of recommendations (HD vs PD centres: 20% vs 42%, $P = 0.006$). Notably, only 20 and 39% of physicians measured patients' arm circumference at least once or investigated patients' conditions (physical and/or emotional stress, tobacco and/or caffeine consumption) before measuring BP, respectively (Figure 1A). Sixty-eight percent of the physicians used integrated devices for measuring BP and 74% stated that these devices had been validated.

Fourteen European centres (14 physicians and 13 nurses) recruited a total of 210 patients (80% >50 years old; 69% men), predominantly undergoing HD (96%) for >24 months (61%). Among these centres, the total score of adherence to BP recommendations was 12 (8–13), 10 (9–12) and 10 (9–12) out of 14 items for physicians, nurses and patients, respectively, without significant differences between the groups (physicians vs nurses: $P = 0.17$; physicians vs patients: $P = 0.1$). Physicians overestimated their overall adherence ($\geq 80\%$ of recommendations) when compared against patients' reports (36% vs 14%, $P = 0.027$). Furthermore, physicians seemed to overestimate their observance especially to some recommendations, such as avoiding placing the cuff over clothes (physicians vs patients: 86% vs 40%, $P = 0.001$), measuring BP in both arms at least once (50% vs 19%, $P = 0.006$), avoiding noises and/or distractions in the room (61% vs 29%, $P = 0.017$) and investigating patients' conditions before measuring BP (43% vs 18%, $P = 0.02$) (Figure 1B). Finally, 75% of patients measured their BP at home, most of them only if needed (56%), and only 44% performed an ambulatory BP monitoring (ABPM) at least once.

To our knowledge, this is the first study assessing adherence to BP measurement recommendations in dialysis centres and comparing physicians' with patients' experience. In agreement with previous studies in other patient subsets [3, 5], our findings show that standard recommendations for measuring BP are poorly followed in dialysis centres according to physicians themselves, and even less according to patients. In particular, few physicians measure BP on both arms and the arm circumference at least once, and/or ask whether patients have been exposed to stressful conditions before BP measurement. While patients' nervousness may be expected during medical consultations, measuring the arm circumference and BP on both arms should be mandatory in order to avoid incorrect BP values [6] and inadequate clinical decisions, and to properly stratify patients' cardiovascular risk [7]. Furthermore, when compared with patients' views, physicians' adherence to recommendations appears to be substantially overestimated.

As a whole, the results of our survey may not only partly explain the poor association of peridialytic BP with ABPM, but also and more importantly with cardiovascular outcomes [1].

Several reasons may account for poor adherence to BP measurement recommendations: lack of time, uncomfortable

settings, insufficient training and tendency to give low importance to how to perform BP measurements [8]. The better score in PD centres may be partly explained by the more relaxed setting in which BP is measured, much like a regular out-patient clinic. On the other hand, the mistaken belief that BP measurement integrated devices have been clinically validated for dialysis patients as well as, for example, the habit of using the same cuff size irrespective of arm circumference [9] may be indicative of insufficient training and/or knowledge on correct measurement.

Finally, we highlighted the underuse of out-of-office BP measurements, confirming previous results of a recent NDT Educational survey interviewing nephrologists about ABPM and home BP monitoring [10]. Such findings are even more alarming when considering the higher prevalence of specific BP phenotypes such as non-dipping pattern, nocturnal hypertension or intradialytic hypertension in dialysis patients [11–13].

Although adherence to some recommendations is high, the fact that less than one-third of all physicians adhere to at least 80% of main recommendations is worrying. Hence, a stronger adherence to BP measurement recommendations [2–14] and a more widespread and systematic use of out-of-office techniques, including patient training, is strongly recommended to improve both hypertension diagnosis and management, especially in this high-risk patient category.

SUPPLEMENTARY DATA

Supplementary data are available at [ndt](https://academic.oup.com/ndt/advance-article-abstract/doi/10.1093/ndt/gfz125/5532079) online.

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CONFLICT OF INTEREST STATEMENT

None declared.

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