RESEARCH LETTER

Ambulatory and Home Blood Pressure Monitoring in Hemodialysis Patients: A Mixed-Methods Study Evaluating Comparability and Tolerability of Blood Pressure Monitoring

To the Editor:

Out-of-dialysis unit blood pressure (BP) measurement is a better predictor of adverse outcomes compared with traditional dialysis unit BP measurement among patients receiving thrice-weekly in-center hemodialysis.4–6 Forty-four–hour ambulatory BP monitoring in maintenance hemodialysis patients provides valuable prognostic information but is often not practical in clinical practice.5 Home BP monitoring may be better suited for longitudinal BP monitoring to guide hypertension management.6,7 However, limited evidence exists regarding the tolerability of ambulatory versus home BP in hemodialysis patients.6,9

We evaluated data from the Blood Pressure Lowering in Dialysis (BOLD) Trial (NCT03459807), a pilot randomized trial in which participants were randomly assigned to targeting a home systolic BP (SBP) versus predialysis SBP < 140 mm Hg.10 Fifty hemodialysis patients were recruited, of whom 31 (N = 16 in the home BP arm, N = 15 in the dialysis-unit BP arm) agreed to optional 44-hour ambulatory BP monitoring (Item S1). Participants completed questionnaires about their experience with ambulatory and home BP monitoring. Data were obtained in the 2 weeks before the intervention, including mean predialysis BP (up to 6 treatments), 2 midweek home BP measurements (each the mean of 3 readings), and 44-hour ambulatory BP monitoring. The study received institutional review board approval at both sites (USCF IRB #16–20963 and UW IRB #00003248), and all participants provided informed consent.

Mean age of participants who performed ambulatory BP monitoring was 56 ± 14 years and 13 (42%) were Black (Table 1). Mean predialysis SBP was 146 ± 19 mm Hg, 44-hour ambulatory SBP was 140 ± 21 mm Hg, daytime SBP was 141 ± 20 mm Hg, and nighttime SBP was 134 ± 25 mm Hg. Twenty-four (77%) participants did not experience an appropriate 10% nocturnal BP decline (non-dippers), including 7 (23%) who experienced an increase in nocturnal BP (reverse dippers). The mean number of successful ambulatory BP readings was 67 ± 16 over 44 hours. Three (10%) of the 31 participants had fewer than 15 BP readings and did not wear the monitor beyond the first day.

In participants who performed both ambulatory and home BP monitoring (N = 16), when asked to provide unstructured comments about their BP monitoring experiences (Table 2), participants most commonly described ambulatory BP monitoring as uncomfortable (eg, “… at times the pressure was way too high and unbearable”), intrusive (eg, “Hard to perform daily tasks within the 30-minute interval during the day. I had to stop what I was doing and I lost my train of thought”), or difficult to use (eg, “The cord is too long, I kept sitting on it”). In contrast, participants described home BP monitoring more positively, praising the ease of using the monitors and the new knowledge gained (eg, “It was fun and gave me knowledge of my own BPs”) and referencing planned ongoing use (eg, “I really liked the home BP monitor! I’d like to own one as a result of the study”). While some

Table 1. Characteristics of BOLD Trial Participants Who Underwent Ambulatory and Home BP Monitoring at Baseline

| Characteristic | All Participants Who Underwent 44-h Ambulatory BP Monitoring (n = 31) | Subset of Participants Who Underwent Both Ambulatory and Home BP Monitoring (n = 16) |
|---------------|---------------------------------------------------------------|---------------------------------------------------------------------------------|
| Mean age, y   | 55.5 ± 13.5                                                   | 56.6 ± 13.6                                                                      |
| Black race    | 13 (42%)                                                      | 7 (44%)                                                                         |
| Mean home SBP, mm Hg; n = 16 | 142.1 ± 25.0                                                | 142.1 ± 25.0                                                                     |
| Mean predialysis SBP, mm Hg | 145.7 ± 18.9                                                  | 142.3 ± 14.9                                                                     |
| 44-h ambulatory BP monitoring |                                             |                                                                                 |
| No. of readings | 66.8 ± 15.7                                                 | 69.5 ± 15.4                                                                      |
| 44-hmean SBP, mm Hg | 139.7 ± 20.7                                                | 140.5 ± 20.7                                                                     |
| 44-h mean DBP, mm Hg | 75.7 ± 12.4                                                  | 73.9 ± 13.3                                                                      |
| 44-h mean heart rate, beats/min | 79.1 ± 9.5                                                  | 76.6 ± 9.5                                                                        |
| 44-h SBP average real variability | 13.7 ± 3.7                                                  | 13.7 ± 3.1                                                                        |
| Daytime mean SBP, mm Hg | 141.4 ± 20.0                                                | 142.2 ± 20.0                                                                     |
| Daytime mean DBP, mm Hg | 77.2 ± 12.4                                                  | 75.3 ± 13.8                                                                      |
| Nighttime mean SBP, mm Hg | 133.7 ± 24.7                                                | 136.9 ± 24.6                                                                     |
| Nighttime mean DBP, mm Hg | 71.2 ± 13.6                                                  | 70.2 ± 13.9                                                                      |
| Nondippers    | 24 (77%)                                                      | 14 (88%)                                                                         |
| Reverse dippers | 7 (23%)                                                      | 4 (25%)                                                                          |

Note: Values expressed as mean ± standard deviation or number (percent).
Abbreviations: BOLD, Blood Pressure Lowering in Dialysis; BP, blood pressure; DBP, diastolic blood pressure; SBP, systolic blood pressure
participants expressed minor concerns regarding the home BP monitoring device (e.g., “It is just heavy and bulky”), none of the participants described it as uncomfortable or intrusive. On being asked to perform repeat ambulatory BP monitoring 4 months after randomization, 10 (32%) participants did not agree to repeat the monitoring.
Home BP demonstrated the strongest correlation with ambulatory daytime SBP in the initial 24 hours post-dialysis (Fig S1; r=0.76; 95% CI, 0.43 to 0.91; Fig S2, mean difference, 3.8; 95% limits, −27.9 to 35.5 mm Hg). Predialysis SBP did not correlate well with 44-hour ambulatory SBP (r=0.47; 95% CI, −0.03 to 0.78). Comparing ambulatory versus home BP (Table S1), 2 participants were reclassified from controlled (normal out-of-dialysis and normal predialysis BP) to masked (elevated out-of-dialysis, normal predialysis BP) hypertension, 1 was reclassified from white-coat (normal out-of-dialysis, elevated predialysis BP) to uncontrolled (elevated out-of-dialysis and elevated predialysis BP) hypertension, and 1 was reclassified from masked to controlled hypertension; concordance was seen in 12 of 16 participants.

In conclusion, we observed that home BP monitoring was better tolerated than ambulatory monitoring and identified several themes regarding the tolerability and acceptability of home and ambulatory BP monitoring in hemodialysis patients. Of the subset of participants who agreed to undergo ambulatory BP monitoring, many were unwilling to have repeat monitoring. Ambulatory BP monitoring was described by several participants as uncomfortable and intrusive in daily activities. Alternatively, home BP monitoring was described as easy to perform, with individuals demonstrating high rates of adherence (97.4% during 16 weeks10) and expressing motivation to continue monitoring after the study. BP values obtained by home monitoring were better correlated with those obtained by ambulatory monitoring than predialysis BP. Nonetheless, there may be differences in BP values obtained by home versus ambulatory BP monitoring. Home BP monitoring may be a practical alternative to ambulatory BP monitoring for longitudinal monitoring and management of hypertension in hemodialysis patients.7,9

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SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

Figure S1: Correlation of baseline ambulatory, home, and predialysis systolic BP measurements using: (A) 44-hour ambulatory BP monitoring and (B) initial 24-hour postdialysis ambulatory BP monitoring

Figure S2: Bland-Altman plots demonstrating patient-level differences between home BP values and (A) 44-hour ambulatory BP values and (B) daytime ambulatory BP values in the initial 24-hours post-dialysis

Item S1: Supplementary methods

Table S1: Changes in classification of out-of-office BP parameters compared with predialysis BP between home and ambulatory BP monitoring.

ARTICLE INFORMATION

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