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Antihypertensive Medication Withholding Practices in Hemodialysis: A Survey Study of Patients and Providers

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Most patients receiving hemodialysis have hypertension (HTN) requiring antihypertensive medications¹, but treatment can be limited by intradialytic hypotension (IDH). To minimize IDH, patients are often told to withhold antihypertensive medications prior to hemodialysis; ^{2, 3}, despite little evidence that doing so reduces the occurrence of IDH. Moreover, it could lead to longer periods of uncontrolled hypertension². We surveyed patients receiving hemodialysis and dialysis care providers to better understand current antihypertensive medication-timing practice patterns.

From September 2016 through January 2017, English-speaking patients receiving dialysis in a medium-sized dialysis organization in Northern California, who took at least one antihypertensive medication were asked to complete the anonymous survey (administered by a research team member). Anonymous surveys were sent electronically to dialysis care providers and paper surveys were distributed to providers at local meetings. All provider surveys were self-administered. We used SAS 9.4 (Cary, NC) for all analyses. A p-value <0.05 was considered statistically significant. The study was approved by the Stanford Institutional Review Board and a Waiver of Documentation of consent was granted.

We collected surveys from 189 patients receiving hemodialysis and taking at least one antihypertensive medication. The mean age was 62 (+/-13.4) years, 62% were male, the median dialysis vintage was 3.0 years (IQR 1.0–6.0 years), and they took a mean of 1.8

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AUTHORS' CONTRIBUTIONS

Conception or design, or analysis and interpretation of data: SBH, GMC, TIC

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CONFLICTS OF INTEREST STATEMENT

The results presented in this paper have not been published previously in whole or part. The authors declare that they have no relevant financial interests. Dr. Chertow serves on the Board of Directors of Satellite Healthcare. Dr. Schiller and Mr. Steven Chang are employees of Satellite Healthcare.

antihypertensive medications. We collected surveys from 306 dialysis care providers, of whom two-thirds were dialysis nurses or technicians, and 17% were physicians

Of the patients surveyed, 46% reported withholding one or more antihypertensive medications. Among these patients, 70% and 15% reported that a physician or nurse had advised them to do so, respectively; 20% chose to do so themselves. For patients receiving hemodialysis in the morning and afternoon, most patients withheld medications in the morning on the day of dialysis (Figure 1). Significantly more patients who withheld medications reported IDH than patients who did not withhold, while patients who did not withhold medications were more likely to report consistently high blood pressure (Figure 2A). Of note, 11% of patients who reported withholding medications had no obvious reasons to do so. Among providers, 55% advised patients to withhold one or more antihypertensive medications, with IDH and low pre-dialysis blood pressure cited as the top two reasons (Figure 2B).

When asked whether they routinely took the withheld medication after dialysis, 60% of patients responded yes, 28% responded no, and 12% said that it depended. Responses among care providers was similarly mixed, with 25% reporting that they routinely advised patients to take the withheld dose, 10% reporting no, and 66% responding that it depended.

Our study shows that patients on hemodialysis are commonly withholding antihypertensive medications, most often in the morning on the day of dialysis. Whether patients take the withheld dose after dialysis was highly variable. While more patients who withhold medications reported IDH, over half of patients who did not withhold medications also reported IDH. The effects of antihypertensive medications on the frequency of IDH are unclear. A small uncontrolled study in Japan showed that administering more antihypertensive medications to patients on hemodialysis with uncontrolled hypertension reduced pre-dialysis systolic blood pressure from an average of 175 mm Hg to 154 mm Hg, but had no effect on the frequency of IDH⁴. Aside from an uncertain effect on IDH, withholding antihypertensive medications could lead to adverse clinical sequelae. For example, sudden cessation of beta-blockers and some other agents could lead to surges in sympathetic tone and exacerbate underlying cardiac arrhythmias, although these concerns remain largely theoretical.

Our study has some limitations. Providers who completed the surveys were mostly non-physicians who cannot prescribe medications, and many of the non-physician respondents reported that they provided advice only after discussing it with the treating physician. However, we purposely included non-physician care providers in the study, because they generally spend the most face-to-face time with patients in the dialysis units. We had a relatively low provider survey response rate, and most providers were affiliated with a single organization, although many work part- or full-time with other dialysis providers in the region. We surveyed patients within a limited geographical area so that our results may not be representative of the broader population of patients on hemodialysis.

In summary, we report significant variability among patients on hemodialysis regarding when and why they withhold (or do not withhold) antihypertensive medications. Notably,

among patients who reported withholding antihypertensive medications, 20% chose to do so on their own and 11% had no obvious rationale for doing so. We also found significant differences among dialysis care providers in their approaches to antihypertensive medication timing advice. The heterogeneity in clinical practice patterns may stem from the lack of evidence regarding the timing of administration of antihypertensive medications relative to hemodialysis. Future studies are needed to determine whether withholding antihypertensive medications is a safe and effective strategy for reducing IDH.

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Figure 1:

Patient and provider responses regarding which antihypertensive medications are withheld for patients who undergo hemodialysis A) in the morning and B) in the afternoon.

Figure 2:

Proportion of A) patients on hemodialysis (HD) with the specified characteristics, by whether they withhold antihypertensive medications or not; and B) providers who advise withholding antihypertensive medications because of the specified patient characteristics, stratified by physician and non-physician respondents. BP=blood pressure. * $p < 0.05$.

TABLE 1:

Characteristics of surveyed patients on hemodialysis taking at least one antihypertensive medication. All values are % unless otherwise noted

	All Surveyed Patients	Withholds Antihypertensive Medications		Takes Antihypertensive Medications at Night	
		Yes	No	Yes	No
N (%)	189 (100%)	86 (45.5)	103 (54.5)	124 (62.6)	65 (37.4)
Age, mean (SD), years	61.6 (13.4)	60.9 (12.9)	62.1 (13.9)	60.6 (13.4)	63.5 (13.5)
Male,	61.9	69.8	55.3	58.9	67.7
Dialyzes in the morning	82.5	90.7	82.5	90.3	78.5
Vintage, median (interquartile range), Yrs	3.0 (1.0-6.0)	3.8 (1.0-7.0)	2.8 (1.0-5.0)	3.0 (1.0-6.0)	3.0 (1.0-6.0)
Number of antihypertensive medications, mean (SD)	1.8 (0.9)	1.8 (0.9)	1.9 (1.0)	2.0 (1.0)	1.5 (0.8)
1	46.6	48.8	45.1	38.2	63.1
2	29.6	31.4	28.4	33.3	23.1
3	16.4	12.8	19.6	20.3	9.2
4	6.9	7.0	6.9	8.1	4.6

TABLE 2:

Survey responses from providers of hemodialysis

	All Surveyed Providers	Physicians	Non-Physicians
N (%)	306 (100%)	52 (16.8)	254 (83.2)
Title			
Physician	17.0	100	0
Nurse	43.1	0	52.0
Dietician	3.6	0	4.3
Social worker	1.3	0	1.6
Technician	22.6	0	27.2
Other	1.0	0	1.2
Missing	11.4	0	13.8
Tells to withhold medications	54.6	84.6	48.4
Reasons:			
Intradialytic Hypotension	82.6	95.5	77.8
Difficult to reach dry weight	34.2	47.7	29.1
Low home blood pressure	42.9	50.0	40.2
Low pre-dialysis blood pressure	72.7	72.7	72.7
Other	10.6	4.6	12.9
Tells to take medications at night	35.3	86.5	26.1
Reasons:			
To reduce intradialytic hypotension	33.6	28.9	37.1
To restore nocturnal dipping	33.6	51.1	21.0
Because it is associated with better outcomes	39.3	51.1	30.7
To reduce side effects	40.2	62.2	24.2
Other	23.4	24.4	22.6