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Comparison of intradialytic blood pressure metrics as a standard indicator of intradialytic hypotension based on all-cause mortality prediction

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Objectives:

Intradialytic hypotension (IDH) has been reported to be an important prognostic factor in hemodialysis patients. However, a standard definition of IDH has not yet been determined.

Methods:

We retrospectively analyzed blood pressure metrics obtained during serial dialysis sessions over a 90-day period from a single dialysis center from 2016 to 2017. The mean values and the frequency of specific values of blood pressure were analyzed as predictors of 3-year mortality.

Results: A total of 430 patients who underwent maintenance dialysis were included. The mean age was 63.3 ± 12.4 years and 58.6% were male. A low minimum systolic blood pressure (min SBP) <110 mmHg during dialysis was significantly associated with increased all-cause mortality. The frequency of min SBP <100 mmHg was the most significant predictor of 3-year mortality with an area under the curve (AUC) of 0.722. Furthermore, the frequency of min SBP <100 mmHg significantly increased the predictability of mortality when combined with the presence of other clinical factors (AUC: 0.786 vs. 0.835, $p=0.005$).

Conclusions:

Among the various intradialytic blood pressure metrics, the frequency of min SBP <100 mmHg is the most significant factor related to all-cause mortality. The guidelines for the management of blood pressure in dialysis patients should consider including min SBP <100 mmHg as a definition for IDH.

table2. Three-year mortality risk according to the intradialytic blood pressure metrics and ultrafiltration rate.



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Supplementary Table 2. Three-year mortality risk according to the intradialytic blood pressure metrics and ultrafiltration rate.

BP metrics	Number of patients in groups	Univariable		Multivariable	
		OR (95% CI)	p-value	OR (95% CI)	p-value
max SBP					
<130	62	4.79 (0.58-39.33)	0.145	1.84 (0.21-16.30)	0.584
130-149	185	2.02 (0.25-16.09)	0.505	0.95 (0.11-7.95)	0.959
150-169	167	1.93 (0.24-15.41)	0.537	1.16 (0.14-9.66)	0.892
170 \leq	16	1 (ref)		1 (ref)	
max DBP					
<70	90	5.71 (0.72-45.31)	0.099	1.32 (0.14-12.67)	0.808
70-79	187	6.16 (0.81-46.82)	0.079	2.31 (0.27-19.57)	0.442
80-89	121	3.10 (0.39-24.95)	0.288	1.65 (0.19-14.24)	0.651
90 \leq	32	1 (ref)		1 (ref)	
min SBP					
<90	6	10.77 (1.97-58.84)	0.006	9.95 (1.04-95.31)	0.046
90-109	54	3.41 (1.47-7.94)	0.004	2.10 (0.83-5.32)	0.116
110-129	217	1.60 (0.80-3.19)	0.187	1.13 (0.54-2.37)	0.741
130 \leq	153	1 (ref)		1 (ref)	
min DBP					
<50	23	3.29 (0.90-11.99)	0.071	1.20 (0.27-5.33)	0.806
50-59	99	3.96 (1.66-9.41)	0.002	1.63 (0.59-4.55)	0.349
60-69	175	2.60 (1.13-5.98)	0.024	1.81 (0.74-4.44)	0.194
70 \leq	133	1 (ref)		1 (ref)	
ΔSBP					
<15	59	1 (ref)		1 (ref)	
15-19	134	1.36 (0.47-3.94)	0.569	1.66 (0.54-5.11)	0.376
20-24	117	1.23 (0.41-3.68)	0.706	1.20 (0.38-3.83)	0.758
25 \leq	120	2.84 (1.03-7.86)	0.044	2.97 (1.00-8.83)	0.05
ΔDBP					
<10	159	1 (ref)		1 (ref)	
10-14	202	1.53 (0.77-3.04)	0.224	1.79 (0.87-3.71)	0.116
15 \leq	69	3.39 (1.56-7.35)	0.002	3.81 (1.62-8.96)	0.002
UFR					
<7	191	1 (ref)		1 (ref)	
7-9	125	0.68 (0.35-1.31)	0.247	0.80 (0.39-1.64)	0.543
10-12	86	0.44 (0.19-1.04)	0.062	0.49 (0.19-1.25)	0.134
13 \leq	28	0.60 (0.17-2.09)	0.42	0.69 (0.18-2.75)	0.602

All the BP metrics and UFR were calculated by mean value of dialysis sessions during 90 days.

Univariable Cox regression analyses for all-cause mortality according to clinical characteristics of hemodialysis patients.



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Supplementary Table 1. Univariable Cox regression analyses for all-cause mortality according to clinical characteristics of hemodialysis patients. [↵]

Variables [↵]	HR (95% CI) [↵]	p-value [↵]
Age [↵]	1.06 (1.03-1.08) [↵]	<0.001 [↵]
Male sex [↵]	0.85 (0.51-1.43) [↵]	0.544 [↵]
Body mass index [↵]	0.89 (0.83-0.96) [↵]	0.003 [↵]
Diabetes mellitus [↵]	0.78 (0.47-1.29) [↵]	0.334 [↵]
Hypertension [↵]	0.69 (0.37-1.28) [↵]	0.237 [↵]
Cardiovascular disease [↵]	1.08 (0.57-2.03) [↵]	0.815 [↵]
Vascular access [↵]		[↵]
arteriovenous fistula [↵]	1 (ref) [↵]	[↵]
arteriovenous graft [↵]	5.32x10 ⁻¹⁶ (3.08x10 ⁻¹⁶ -9.18x10 ⁻¹⁶) [↵]	1.000 [↵]
internal jugular catheter [↵]	5.01 (0.68-36.79) [↵]	0.113 [↵]
permanent catheter [↵]	3.64 (2.16-6.12) [↵]	<0.001 [↵]
Dialysis duration [↵]	1.00 (1.00-1.00) [↵]	0.945 [↵]

Abbreviations: HR, hazard ratio; CI, confidence interval.[↵]