Is Faster Clevidipine Titration Associated with Shorter Time-to-Target Blood Pressure in Neurocritical Care?

CDTL Clinical Decision Technology Laboratory

NEUROCRITICAL CARE SOCIETY

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BACKGROUND

During neurocritical ICU care, optimal management of hypertension may prevent adverse outcomes.

The objective of this analysis is to identify factors affecting time-to-target blood pressure (BP) goals. Primary analysis focused on patients treated with clevidipine, an ultra-short-acting dihydropyridine calcium channel blocker, which is an attractive pharmacologic agent in this setting due to its prompt onset, rapid offset, and ease of titratability.

METHODS

In the primary analysis, we performed a retrospective, single-center study of patients for whom clevidipine infusion was initiated in the neurocritical ICU for hypertension control. We analyzed patients from 2023 to 2025 for whom we had continuous BP data available from a hospital archive, the Philips Capsule Medical Device Information Platform. Clinical data, including individualized BP goal ranges, were extracted from the electronic medical record.

The primary outcome was time-to-target BP goal, defined as the time interval from clevidipine initiation to the earliest instance when the 10-minute median BP met the patient-specific BP goal. Examples of clevidipine initiation and up-titration are shown in **Figure 1** and **Figure 2**.

We used linear regression to examine the association between medication titration rate and time-to-target BP.

We dichotomized subjects into two groups — "faster" (< 6 min per dose change) and "slower" (≥ 6 min per dose change) — based on the histogram distribution (**Figure 3**) of their clevidipine titration speed during initiation phase. Since the outcome was a continuous parameter, regression was used for statistical testing, while dichotomized categorization was performed to better illustrate the differences between the two groups.

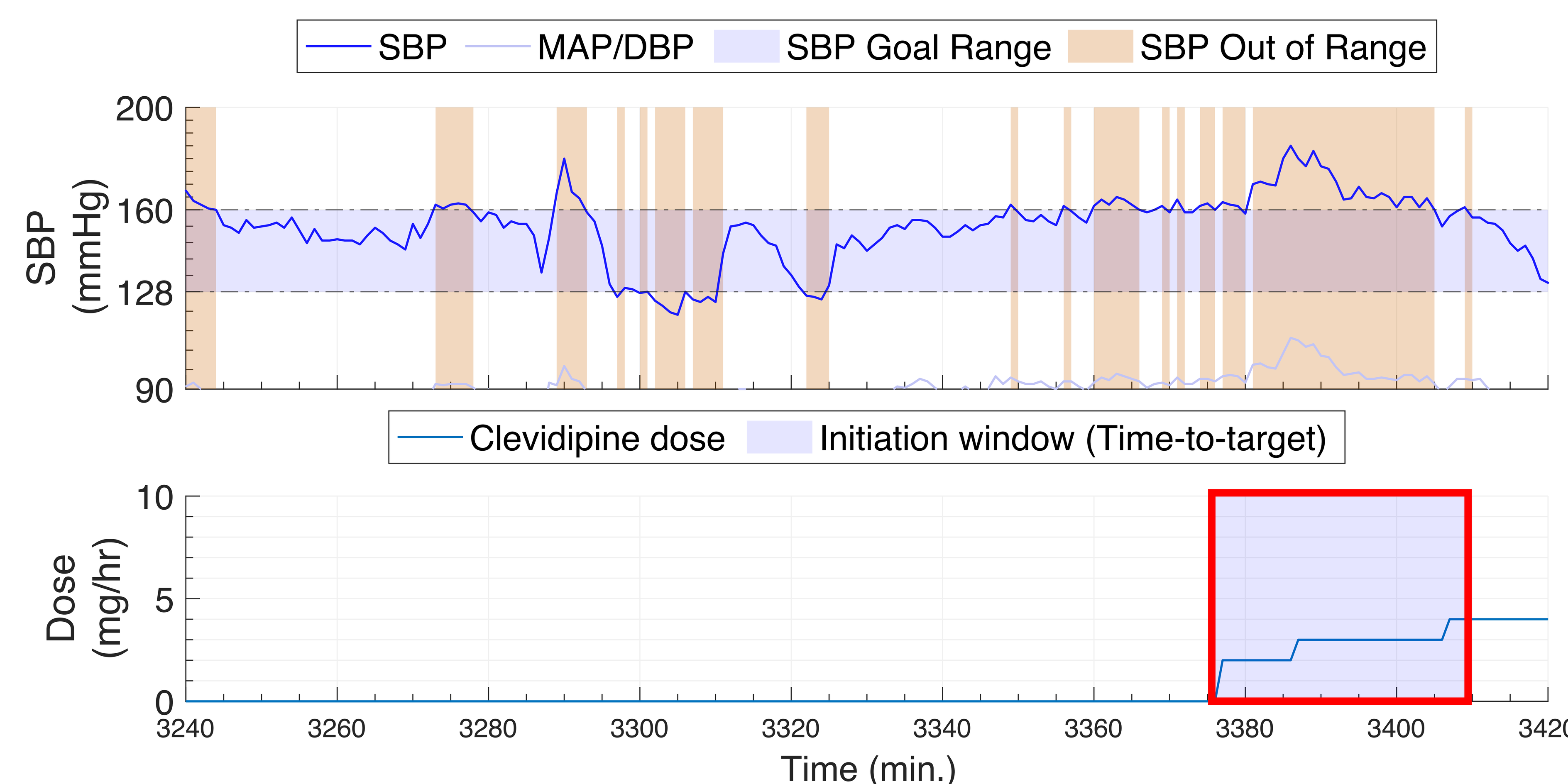

FIG 1: "Slower" titration example. 79 y/o M with intraparenchymal hemorrhage. The initiation interval (see **red box**) contains three clevidipine dose up-titrations. At approximately t=3410, blood pressure was brought into its target range. Average titration interval was 11.0 min/dose and time-to-target was 33 minutes.

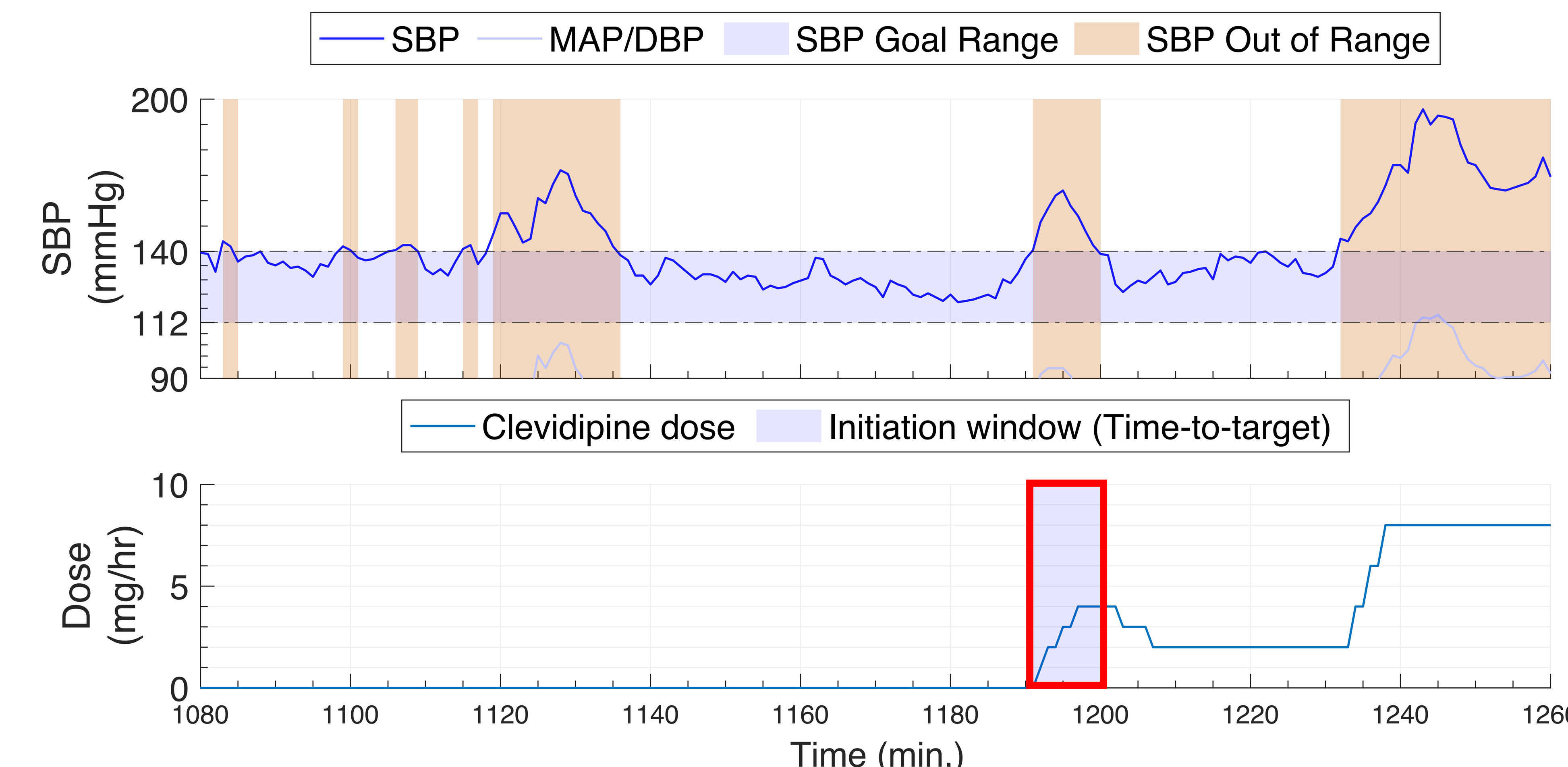

FIG 2: "Faster" titration example. 24 y/o M with subdural hematoma. The initiation interval (see **red box**) contains three clevidipine dose up-titrations. At t=1199, blood pressure was brought back into its target range. Average titration interval was 2.7 min/dose and time-to-target was 8 minutes.

RESULTS

We identified 356 ICU patients treated with clevidipine. For these, continuous BP data were available in our archive for 105 patients, including 21 patients that had clevidipine initiated after neurocritical ICU admission. Most had intracranial hemorrhage (n=16 / 76%). The median age was 54 years (IQR 41 – 73.5) and the majority (n=18 / 86%) were male.

Excluding 4 subjects in whom BP was well-controlled at clevidipine initiation, the median time-to-target was 19 minutes (IQR 10 – 27.5). ***Regression showed a highly significant association between longer titration interval and time-to-target (p < 0.001).*** Subject characteristics for patients with faster titration (i.e., < 6 min per dose change) versus slower titration (≥6 min) during clevidipine initiation are provided in **Table 1**. Case examples of slower titration (**Figure 1**) and faster titration (**Figure 2**) are shown.

CONCLUSION

We conducted a pilot study in a small cohort of neurocritical ICU patients treated with clevidipine for hypertension management. Even though the cohort was small, faster up-titration of clevidipine was very significantly associated with a shorter time-to-target BP in each group. This has treatment implications, highlighting that slow up-titration intervals may put patients at risk of prolonged time-to-target. Additional analysis in a larger patient cohort is warranted in order to further explore potential confounders and understand factors associated with optimal BP management using clevidipine.

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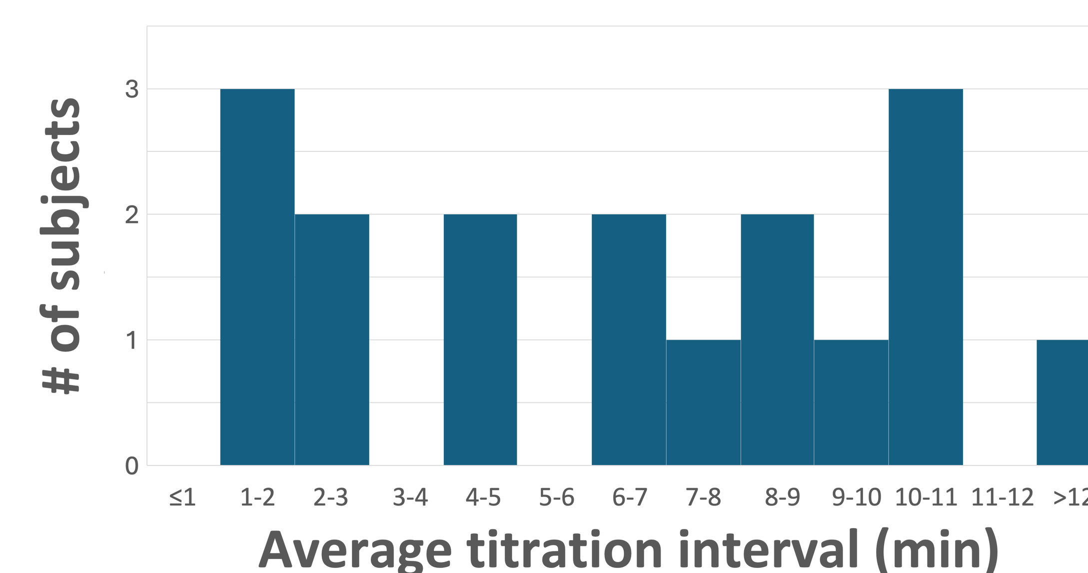

FIG 3: Histogram distribution of titration interval per subject (n=17). This histogram shows the titration interval (min per dose) for subjects during initiation phase. This excludes 4 subjects in whom BP was well-controlled at clevidipine initiation.

Table 1: Subjects with "faster" vs "slower" clevidipine titration

	"Faster" clevidipine subgroup	"Slower" clevidipine subgroup
Number of subjects	7*	10*
Average titration interval, median (IQR)	2.7 min/dose (1.7 – 4.4)	9.5 min/dose (8.0 – 10.5)
BP at clevidipine initiation (relative to goal range), median (IQR)	6.5 mmHg above range (2.5 – 11.0)	12.0 mmHg above range (3.0 – 26.0)
Median BP in 10 minutes prior to dose start (relative to goal range), median (IQR)	3.3 mmHg above range (-0.3 – 5.3)	9.9 mmHg above range (4.0 – 18.0)
# of dose titrations in initiation window, median (IQR)	4 (4 – 6)	2.5 (2 – 6)
Most common starting dose (mg/hr)	1.0	1.5
Highest peak dose (mg/hr)	17.0	21.0
% of patients with other IV agents present in dose initiation window	0.0 %	20.0 %
Time to target, mean	13.1 minutes	56.0 minutes
Time to target, median (IQR)	12.0 minutes (8.0 – 19.0)	21.0 minutes (18.0 – 50)

****excludes 4 subjects in whom BP was well-controlled at clevidipine initiation.***