Cost Consequences Analysis of Using Clevidipine in Acute Hypertension from the Perspective of a US Hospital.

EE125

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INTRODUCTION

Background

- Rapid reduction of blood pressure (BP) with intravenous (IV) anti-hypertensive agents is required in various clinical settings when oral therapy is not feasible or not desirable
- Clevidipine is an IV dihydropyridine calcium channel blocker indicated for the reduction of blood pressure.
- Clevidipine works by dilating arteries, thus reducing blood pressure. Clevidipine has a fast onset and offset of action making it easily adjustable to achieve desired blood pressure levels.

Objective

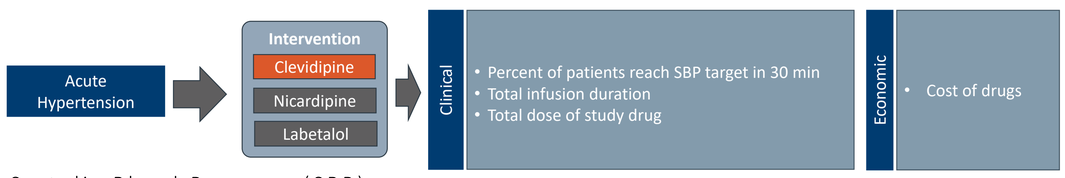
The aim of the cost consequence analysis was to estimate the economics and consequences of varying clevidipine utilization in patients with acute hypertension (aHTN).

METHODS

Model Summary

- A decision analytic model was developed to simulate the costs and consequences associated with the use of clevidipine, labetalol, and nicardipine in patients with severe aHTN in the emergency room or critical care setting. (**Figure 1**).
- The outcomes were quantified from a US hospital perspective over a 3-year time horizon.

Figure 1. Model Structure



Model Inputs

- The model inputs included utilization of acute IV anti-hypertension medications **(Table 1)**, SBP target data **(Table 2)**, dosing information **(Table 2)**, and economic input **(Table 3)**.

Utilization

- The utilization of IV anti-hypertensives was calculated based on a retrospective analysis of acute hypertension drug purchase history using Definitive Healthcare claims from 2021.[1]
- Diagnosis Related Group (DRG) codes were used to define acute hypertension claims.
  - Medicare Severity Diagnosis Related Groups (MS-DRGs) included: 304,305
  - Hospitals above 20 or more hypertension DRG claims (median) were included in the IV-anti-HTN utilization analysis.
  - Low (cohort 1) and high(cohort 2) clevidipine adopter profiles were formed calculating the average utilization for clevidipine, labetalol and nicardipine.
    - Cohort 1 represents the low adopter profile with <10% clevidipine utilization.
    - Cohort 2 represents the high adopter profile with ≥10% clevidipine utilization.

- A change in utilization was modelled starting with cohort 1 as the base year with a steady increase in clevidipine adoption to reach cohort 2 in the third year.**(Table 1)**
- The utilization of nicardipine RTU (0.1 mg/mL) and nicardipine vials are assumed to be equal. Actual use may vary.

Table 1. Projected IV Anti-HTN drug market share

Agent	Base Year (Cohort 1)	Year 1	Year 2	Year 3 (Cohort 2)
Clevidipine	1%	14%	26%	39%
Labetalol	32%	29%	27%	24%
Nicardipine	67%	57%	47%	37%
Total	100%	100%	100%	100%

Note: Percentages are rounded and may not add to 100% as shown

Clinical Inputs

- The clinical inputs were based on published literature.[2-9]
- This acute hypertension analysis is based on a naïve indirect comparison of two studies evaluating BP reduction in the acute hypertension setting. One single-arm prospective study assessing time to target BP with clevidipine (VELOCITY), and the other being an open-label, randomized trial comparing time to target BP with nicardipine or labetalol (CLUE).
  - VELOCITY evaluated patients presenting to ED or ICU with SBP >180 mmHg or diastolic blood pressure [DBP] >115 mmHg. Median baseline SBP was 202 mmHg and target SBP was physician specified with a range of 20-40 mmHg from upper to lower limit. BP was measured and dose titrated every 3 minutes until target achieved.
  - CLUE evaluated intermittent bolus IV labetalol versus continuous IV nicardipine in for BP reduction in patients presenting to the ED with SBP >/=180 mmHg. Median baseline SBP was 211, and target SBP range was physician specified +/-20 mmHg. Dosages recommended in respective Prescribing Information were encouraged, however actual doses were administered or titrated per physician discretion and reflected actual clinical practice.
- The infusion duration was chosen to calculate the 24 hr (daily) consumption and cost of infused IV anti-hypertensive medications. The published dose was used for bolus anti-IV-HTN medications.

Table 2. Key Model Assumptions

	Clevidipine	Labetalol	Nicardipine
Overall mean infusion rate (mg/h)[10]	8.0	N/A - bolus dosing	9.2
Infusion duration (h)	24.0	N/A - bolus dosing	24.0
Calculated Total dose (mg)[6]	192	300[6]	221
Concentration (mg/mL)[5-7]	0.5[5]	1[6]	0.1[7]
Calculated Total volume (mL)	384	300	2208
% Patient using 1 IV antihypertensive [8,9]	96.7%	32%	51%
% Patient using 2 IV antihypertensives [8,9]	3.3%	42%	28%
% Patient using 3 or more IV anti-hypertensives[8,9]	0.0%	25%	21%
Total (% Patient using 1-3 IV anti-hypertensives)	100%	100%	100%
Calculated weighted average # of IV anti-hypertensives	1.03	1.93	1.70
% Patients reach target SBP in 30 min[2,4]	88.9%	91.7%	82.5%
Median time to achieve BP target (min)[2,3]	10.9*	30	30

Note: Clevidipine has not been studied head-to head with any of the comparators

- Average infusion rates were based on customer survey data.[10] **(Table 2)**
- The drug concentration[3-5], number of IV anti-hypertensive use[1,6] ,SBP control information [1,2] were derived from literature and the total volume values were based on calculations. **(Table 2)**

Economic Inputs

- The drug acquisition costs were informed by wholesale acquisition costs (WAC) from ProspectoRx.com.[11] **(Table 3)**
- All costs have been adjusted to 2022 USD using Medical Care Consumer Price Index based on Federal Reserve Economic data.[12]

Table 3. Acquisition Costs

Agent	NDC code	Utilization	Acquisition price/ml[10]
Nicardipine vial	72572-0470-01	50%	$0.19
Nicardipine RTU	0143-9634-10	50%	$0.51
Clevidipine	10122-0610-01	NA	$1.46
Labetalol	72266-0103-01		$0.06

RESULTS

- For a hypothetical caseload of 100 patients with acute hypertension, the use of clevidipine resulted in 2 (1.7%) additional patients reaching BP target in 30 minutes **(Figure 2a)**
- The average time to reach blood pressure target was 7.2 min faster. **(Figure 2b)**
- Additionally, there were 27 fewer cases of concomitant or subsequent IV anti-hypertensive use.
- The average infusion time increased with reduced use of bolus medications. **(Figure 2c)**
- The average primary drug infusion volume was reduced by 549 mL per patient. **(Figure 2d)**
- The number of IV anti-hypertensives reduced from 1.8 to 1.5. **(Figure 2e)**
- The average drug costs decreased by $84/patient. **(Figure 2f)**

Figure 2: Results Per Patient

Figure 2a. Patients reaching target SBP in 30 min

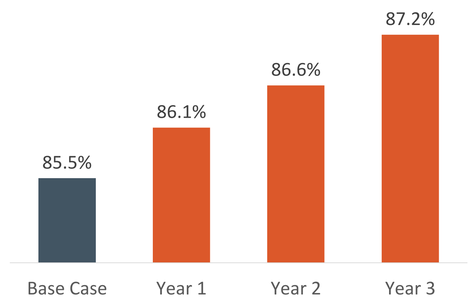


Figure 2b. Median time (minutes) to achieve BP target

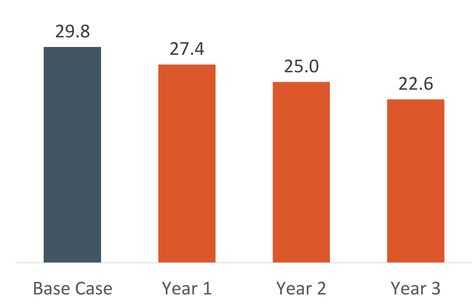


Figure 2c. Infusion duration (hours)

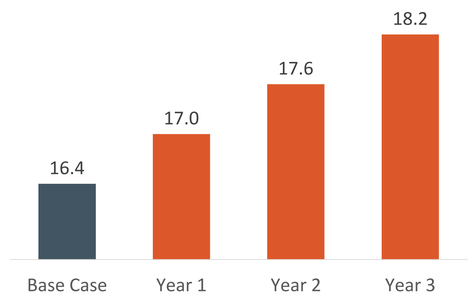


Figure 2d. Infusion volume of primary drug (mL)

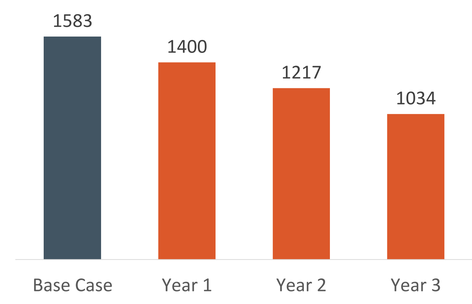


Figure 2e. Number of IV anti-hypertensive per patient

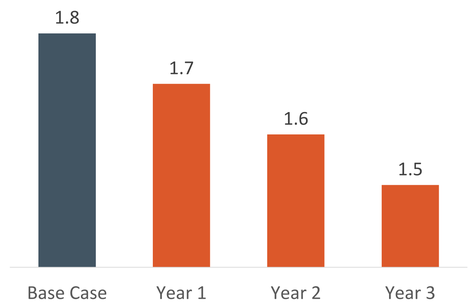
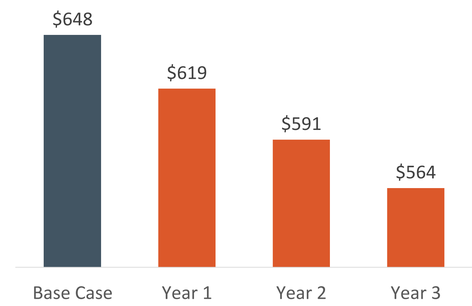


Figure 2f. Total IV anti-hypertensive drug costs per patient



CONCLUSION

- The increased use of clevidipine in patients with acute hypertension results in lower drug costs per patient with acute hypertension. Additionally, outcomes are improved from more patients reaching BP target in less time with a decrease in the cost over the 3 years.

ASSUMPTIONS AND LIMITATIONS

- Clevidipine has not been studied head-to head with any of the comparators. Further prospective research is warranted.
- As a simplifying assumption, only up to 3 IV anti-hypertensives are assumed to be used.
- Vasopressors are excluded from the analysis. Vasopressors may be used in conjunction with IV-antihypertensives which could impact costs and outcomes. The concomitant use of vasopressors and IV anti-hypertensives has not been well-established and requires further prospective research.

DISCLOSURES

IJ, AS, are PRECISIONheor consultants for Chiesi USA, Inc. and received grants/research funding; and MG, SW, AC and EP are employees of Chiesi USA, Inc\

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