# Outpatient intravenous sotalol load to replace 3-day admission oral sotalol load

Nicholas H. Von Bergen, MD, Arij G. Beshish, MBBCh, PhD, Kathleen R. Maginot, MD

*From the The University of Wisconsin – Madison, Madison, Wisconsin.*

## Introduction

Atrial arrhythmias, such as intraatrial reentrant tachycardia (IART) or atrial fibrillation, are commonly seen in older adults and in those with palliated congenital heart disease. With appropriate monitoring, especially at the time of initiation, sotalol can be a safe and effective medication to treat atrial arrhythmias.[1] Unfortunately, owing to its proarrhythmia risk, sotalol initiation typically requires a 3-day hospitalization to monitor for significant QT lengthening or arrhythmias.

Intravenous (IV) sotalol has been approved for the acute treatment of arrhythmias, for the replacement of oral sotalol in those who are unable to take oral medication, and for recurrent atrial arrhythmias. Although IV sotalol is not currently approved by the United States Food and Drug Administration to replace an oral sotalol load, the IV formulation rapidly reaches a steady state, potentially allowing patients to transition quickly to oral dosing at a therapeutic steady state. This novel IV sotalol load could decrease the length of hospital admission, decrease overall admission cost, and improve patient satisfaction.

We describe the first use of a single-dose IV sotalol load with an outpatient observation period to replace the multiple-day oral sotalol load admission. This was completed in an adult with congenital heart disease, a history of recurrent atrial arrhythmias, and psychiatric comorbidities.

**KEY TEACHING POINTS**

- Intravenous (IV) sotalol was successfully used to replace an oral sotalol load. Owing to the rapid steady state, the sotalol load was able to be completed within 10 hours.
- IV sotalol loading as a replacement for oral loading has the potential to decrease length of hospital stay and the associated expenses.
- However, IV sotalol is not currently approved by the United States Food and Drug Administration for this indication.

## Case report

A 30-year-old man with a weight of 90 kg and a history of complex congenital heart disease, including aortic stenosis and mitral valve disease, had undergone multiple palliative procedures, including a valvuloplasty, Ross and Bentall procedures, and a mitral valve repair. He had a history of recurrent atrial arrhythmias including IART and atrial ectopic tachycardia.

Two years previously, he had undergone an electrophysiology study that demonstrated multiple IART circuits, for which he underwent an ablation. Though this provided substantial improvement in his symptoms, he continued to have occasional nonsustained atrial arrhythmias and salvos of IART. Over this time period he had been trialed on carvedilol and metoprolol but continued to report occasional palpitations. Owing to his desire to further decrease symptoms, we discussed a repeat ablation and/or overnight admission for loading of sotalol or dofetilide. The patient had a history of psychiatric concerns and substantial anxiety and declined further procedures and overnight admission. Thus, an outpatient IV sotalol load with transition to oral sotalol in a single day was discussed.

The patient was admitted in the morning to a hospital unit with telemetry. Baseline vital signs were taken and a peripheral IV placed. Electrolytes, blood urea nitrogen, creatinine, and creatinine clearance were all normal. Consent was obtained from the patient after discussion of potential risks and benefits of this technique. A baseline electrocardiogram (ECG) showed sinus rhythm with normal QRS duration and QTc of 420–430 ms. Bedside telemetry was adjusted to recognize and alarm for significant lengthening of the QTc.

IV sotalol (40 mg) was administered over 2 hours during continuous monitoring. A 12-lead ECG was performed at 1 hour into the infusion and at the end of the infusion (2 hours). The QTc remained stable both on telemetry and on the

**KEYWORDS** Arrhythmias; Congenital heart disease; Intravenous; Potassium channel blockers; Sotalol
(Heart Rhythm Case Reports 2019;5:382–383)

**Address reprint requests and correspondence:** Dr Nicholas H. Von Bergen, The University of Wisconsin – Madison, 600 Highland Ave, Madison, WI 53792. E-mail address: vonbergen@wisc.edu.



https://doi.org/10.1016/j.hrcr.2019.04.005

12-lead ECGs. There was no significant change in blood pressure or heart rate. No concerning bradycardia or arrhythmias were observed. The IV sotalol dose was well tolerated, with no patient symptoms reported.

Two hours after the infusion was complete an 80 mg oral sotalol dose was given, and ECGs were obtained 2 and 4 hours after the oral dose was administered. These ECGs continued to show QTc measurements less than 450 ms. The oral sotalol dose was well tolerated, with no patient symptoms reported. The patient was discharged home on 80 mg oral solatol twice daily 10 hours after the start of his admission. He has since done well, with minimal palpitations, and remains on sotalol 80 mg twice daily. Follow-up outpatient monitoring for 2 weeks show minimal ectopy, with up to 4-beat runs of atrial tachycardia. His QTc has remained stable below 450 ms.

## Discussion

Atrial arrhythmias are the most common sustained cardiac arrhythmias in clinical practice. Sotalol may be considered for arrhythmia control but typically requires a 3-day admission for monitoring during the oral loading period. This 3-day admission results in personal and financial burden to the patient, use of hospital resources, and potential for iatrogenic risk to the patient. In some cases, as with this patient, a hospitalization may also create substantial anxiety. These concerns, along with the substantial psychiatric comorbidities with our patient, prompted us to use the IV formulation to decrease the length of hospital admission for sotalol loading.

To our knowledge, this is the first use of IV sotalol to replace the 3-day admission for elective initiation of oral sotalol. It should be noted that IV sotalol is considerably more expensive than the oral form. For example, the acquisition costs of a 150-mg vial of IV sotalol at the University of Wisconsin is over $1400, while an 80 mg oral tab is less than 10 cents. Even so, the potential cost savings from reducing admission time with IV sotalol initiation has been estimated between $3000 and $4000.[2–4] As with our patient, there were also substantial patient benefits, including shorter time in the hospital and substantial anxiety reduction. In addition, there is a potential advantage of earlier time to peak effectiveness of the medication in those with concurrent or frequent arrhythmias.

Currently the data regarding an optimal dosing regimen for a loading admission with IV sotalol transitioning to an oral regimen are lacking.[5] We chose our dosing regimen based on data originally reported from the University of Maryland that determined that 40 mg IV over 2 hours was comparable to a 3-day loading regimen at 80 mg twice a day in patients with postoperative atrial fibrillation.[6] There have been concerns regarding potential for QTc prolongation owing to high doses of sotalol. However, the initial sotalol effect occurs within 30 minutes of infusion, and a peak effect occurs within 2 hours. Close observation and telemetry during these times as well as prior evaluation of renal function proved the procedure safe for our patient. It is important to note that the regimen used in this patient cannot at this point be generalized to all patients until more data are available.

## Conclusion

We describe the first use of a single-day (outpatient) IV sotalol load to replace the multiple-day oral sotalol load. An adult patient with symptomatic atrial arrhythmias, congenital heart disease, and psychiatric comorbidities tolerated a 40 mg IV sotalol dose over 2 hours, followed by a single 80 mg oral sotalol dose during a 10-hour outpatient observation period. He was discharged home on oral sotalol (80 mg orally twice a day) and has had a stable QTc, improvement in symptoms, and no arrhythmias or concerning symptoms.

## References

1. Samanta R, Thiagalingam A, Turner C, Lakkireddy DJ, Kovoor P. The use of intravenous sotalol in cardiac arrhythmias. Heart, Lung and Circulation 2018; 27:1318–1326.
2. Kim MH, Klingman D, Lin J, Pathak P, Battleman DS. Cost of hospital admission for antiarrhythmic drug initiation in atrial fibrillation. Ann Pharmacother 2009; 43:840–848.
3. Sheikh A, Patel NJ, Nalluri N, et al. Trends in hospitalization for atrial fibrillation: epidemiology, cost, and implications for the future. Prog Cardiovasc Dis 2015; 58:105–116.
4. Tang K, Mattingly TJ II, Ayres J, See V, Reed B. Cost-minimization analysis of atrial fibrillation and atrial flutter through intravenous sotalol loading. J Am Coll Cardiol 2018;71:A491.
5. Ho DS, Zecchin RP, Cooper MJ, Richards DA, Uther JB, Ross DL. Rapid intravenous infusion of d-1 sotalol: time to onset of effects on ventricular refractoriness, and safety. Eur Heart J 1995;16:81–86.
6. Yarlagadda B, Vuddanda V, Dar T, et al. Safety and efficacy of inpatient initiation of dofetilide versus sotalol for atrial fibrillation. J Atr Fibrillation 2017;10:1805.