

## Excessive Use of Landiolol is Associated with a High Economic Cost

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### Abstract

Intravenous landiolol hydrochloride can help prevent atrial fibrillation after cardiovascular surgery. We retrospectively evaluated the effects of landiolol use on the cost of two groups of patients from the same hospital. Landiolol was routinely used by the surgical team for Group L (n=27), and transdermal bisoprolol was mainly used for Group B (n=85). The costs per patient were 1,025,000 yen (9,230 USD) in Group L and 47,000 yen (420USD) in Group B. Routine and excessive landiolol use after cardiovascular surgery was associated with a high economic cost. As economic cost is an important consideration, given hospital resource constraints, landiolol use should be carefully evaluated.

two groups. The first group was treated by a previous surgical team (04/2015–03/2016) and routinely received postoperative prophylactic intravenous landiolol to prevent AF and control their heart rate (Group L, n=27). The second group was treated by the current surgical team (04/2016–03/2017) and mainly received transdermal bisoprolol with landiolol as needed (Group B, n=85). The outcome of interest was the economic costs of treatment outside the operating room for the two groups. The two groups' costs were compared using Yate's chi-square test, and the data were analyzed using SPSS software. Approval for the use of these data was obtained from the institutional review board of Fujisawa City Hospital on June 20, 2017.

### Introduction

Intravenous landiolol hydrochloride can help prevent Atrial Fibrillation (AF) after cardiovascular surgery although this treatment is relatively expensive [1,2]. As economic cost and cost-effectiveness are important considerations, given hospital resource constraints, we aimed to evaluate the economic cost of excessive landiolol use.

### Patients and Methods

One hundred and twelve consecutive patients who underwent cardiac surgery were retrospectively divided into

### Results

The 27 cases in Group L included 11 cases of ischemic disease, 11 cases of thoracic aortic disease, 3 cases of valve disease, and 2 cases of other diseases. The 85 cases in Group B included 32 cases of ischemic disease, 26 cases of thoracic aortic disease, 22 cases of valve disease, and 5 cases of other diseases. The costs of the landiolol and transdermal bisoprolol treatments are shown in table 1[Table1]. The costs per patient were approximately 1,025,000 yen (9,230 USD) in Group L and 47,000 yen (420USD) in Group B. Approximately 44% of the patients in Group L experienced new postoperative AF, compared to 20% of the patients in Group B (P=0.03).

**Table 1 Drug costs**

	Landiolol			Transdermal bisoprolol		
	Cases	Amount (vials)	Cost (yen / USD)	Cases	Amount (sheets)	Cost (yen/USD)
<b>Group L</b>	26	4,208	27,676,016 yen	1	1	87 yen
<b>(n=27)</b>			(249,000 USD)			(0.8 USD)
<b>Group B</b>	10	608	3,998,816	39	111	9,613
<b>(n=85)</b>			(36,000 USD)			(86.7 USD)

The costs were calculated based on 6,577 yen (59 USD) /vial (50mg) for landiolol and 86.6 yen (0.8USD) /sheet (4mg) for transdermal bisoprolol. The exchange rate for calculation was 111 (yen) to the US dollar.

## Discussion

Prophylactic administration of beta-blockers has been recommended to prevent postoperative AF which is the most common complication of cardiac surgery. Landiolol is occasionally used in the operating room and intensive care unit to control the patient's heart rate and prevent postoperative AF [1,2]. Although bisoprolol plays similar pharmacologic effect as landiolol, controllability of transdermal bisoprolol is not equivalent to intravenous infusion of landiolol. Although the rapid therapeutic effects of landiolol are attractive to anesthesiologists and cardiovascular surgeons, our hospital's current management does not welcome its overuse, as most drug costs outside the operating room are borne by the hospital, based on the diagnosis procedure combination system. We did not consider the drug costs from inside the operating room in this study, as these costs are typically reimbursed through the patient's insurance coverage.

Postoperative landiolol is typically administered at a dose of 5 microgram/kg/min, and the cost to treat a 60-kg patient for 3 days is approximately 170,000 yen (1,530 USD) at our hospital [1]. In contrast, the cost of a 3-day transdermal bisoprolol treatment (4mg) is approximately 260 yen (2.3 USD) at our hospital (based on current drug costs). Although we did not aim to perform a cost-effectiveness comparison of the two drugs, landiolol was associated with a high economic cost. It is also possible that the clinical treatment partially explains the high cost in Group L, as the previous surgical team was associated with prolonged surgeries, large doses of inotropic drugs, severe edema, and overuse of diuretic drugs (data not shown). Thus, the patient's in Group L might have required large amounts of landiolol to address these issues. We hope that our findings will help ensure appropriate utilization of hospital resources.

## Limitations

This study's retrospective design compared clinical outcomes from consecutive years at a single hospital. However, there were differences in the two groups' patient backgrounds, surgical team, and postoperative management policies. Therefore, the high incidence of postoperative AF in Group L does not indicate that landiolol was inferior to transdermal bisoprolol for preventing AF.

## Conclusions

Routine and excessive use of landiolol after cardiovascular surgery was associated with a high economic cost. As cost-effectiveness is an important consideration, given hospital resource constraints, we recommend carefully evaluating the benefits of routine landiolol use.

## Conflicts of interest

The authors have declared no competing interests.

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