Predictors of Perioperative β-Blockade Use in Vascular Surgery: A Mail Survey of United States Anesthesiologists

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Objectives: It was hypothesized that anesthesiologists' decisions to provide perioperative β-blockade during vascular surgery would be influenced more by physician factors than by those of their patients.

Design: Mail survey.

Setting: Case presentation.

Participants: Four hundred thirty-nine anesthesiologists in the United States who responded to a survey.

Interventions: By using Microsoft Word Mail Merge (Microsoft, Redmond, WA), 6 factors in a hypothetical patient presenting for vascular surgery (sex, race, age, comorbidities, functional status, and magnitude of surgical stress) were randomly varied.

Measurements and Main Results: The response rate was 22%. Self-reported propensity to use β-blockade was significantly increased among anesthesiologists who worked in New England, among those who worked in larger hospitals, or who had received fellowship training. Among healthy patients, β-blockers were more likely to be used for older than younger patients. Among sicker patients, however, the reverse was true. Heart rate triggers for β-blockade use were higher than heart rates associated with improved outcomes in pivotal β-blocker trials.

Conclusions: Preferences for perioperative β-blockade use in vascular surgery patients are influenced by anesthesiologists' demographics as well as patient comorbidities or degree of surgical stress. This finding suggests that efforts to increase perioperative β-blockade in high-risk vascular patients face significant barriers from some groups of clinicians.

KEY WORDS: *adrenergic β-antagonists, health care surveys, tachycardia, physicians' practice patterns, clinical practice variations, vascular surgical procedures*

PHYSICIAN COMPLIANCE with literature-based care guidelines can vary significantly.[1] Little data exist, however, regarding the compliance of anesthesiologists with literature-based evidence or with clinical guidelines.

It is likely that anesthesiologists are similar to other physicians in the use of literature-based clinical guidelines. Although randomized trials have shown that perioperative β-blockade is cardioprotective in high-risk noncardiac surgery,[2,3] chart reviews and administrative databases indicate that perioperative β-blockade continues to be underused.[4,5] Because many current trials presume the literature-guided use of β-blockers as "standard care," failure to comply with such use may invalidate the results of other, related trials. For example, a recent trial showed that coronary revascularization before vascular surgery produced outcomes similar to aggressive medical therapy that included β-blockers extensively.[6] Therefore, the authors believe it imperative to identify barriers to the implementation of perioperative β-blockade. The recent revision of the American Heart Association/American College of Cardiology guidelines specifically focused on appropriate use of β-blockade, in part to facilitate the creation of clinical pathways and pay-for-performance initiatives.[7,8]

Today, only half of the patients who should probably receive perioperative β-blockade actually receive it at the time of surgery.[9] Surveys of anesthesiologists have suggested a number of barriers to implementation of perioperative β-blockade. These include a lack of standardized institutional clinical pathways[10] and disagreement as to which services (anesthesia, surgery, and cardiology) should manage the process.[11] Reported enthusiasm among clinicians to provide perioperative β-blockade appears to diminish as baseline risk of coronary artery disease (CAD) diminishes (from known CAD to vascular surgery to general surgery with CAD risk factors).[11]

The authors hypothesized that physician-specific characteristics would predominate over patient characteristics in predicting physicians' self-reported propensity to provide perioperative β-blockade to patients undergoing vascular surgery.

METHODS

After approval by the University of Chicago Institutional Review Board, a 6-page paper survey was mailed to 2,000 randomly selected anesthesiologists in the United States in November 2003. Names, addresses, and demographic information of anesthesiologists were obtained from the American Medical Association database via a commercial mailing house (Medical Marketing Service Inc, Wood Dale, IL). The survey queried respondents about their practices in general and how they would manage an elderly patient with medical comorbidities scheduled for vascular surgery.

Six variables in the patient presentation section of the survey were randomly generated by using the Microsoft Word Mail Merge feature (Microsoft, Redmond, WA) to produce 64 different questionnaires. The magnitude of vascular surgery (femoral-distal bypass [medium] *v* aortobifemoral bypass [large]), severity of medical comorbidities (hypertension, diabetes, prior myocardial infarction, and moderate stable exertional dyspnea [sick] *v* hypertension alone [healthy]), sex, race (black *v* white), age (65 years old *v* 85 years old), and functional status (living with daughter and gardening *v* living in a nursing home) were varied (Fig 1).

These variations were then randomly distributed among survey recipients. The anesthesiologists were asked about their propensity to use perioperative β-blockade on a 5-point Likert scale, with "1 = would not recommend" and "5 = strongly recommend," and the heart rate (HR) thresholds for doing so. The authors also asked about the choice of anesthetic technique, use of intraoperative monitors, and the estimates of the likelihood of perioperative myocardial infarction or death.

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PLEASE TELL US HOW YOU WOULD HANDLE THE FOLLOWING CLINICAL SITUATIONS:

Mr(s). Jones is an (65 / 85) year old hypertensive (black / white), (male / female) who presents to you for an anesthetic for (femoral distal bypass / aorto-femoral bypass). (S)he has (a history of an MI and PTCA 2 years ago, her EF=35%, and takes Lisinopril, Lasix and Digoxin / no history of coronary artery disease and takes Lisinopril). She lives (with her daughter and enjoys gardening / in a nursing home).

Fig 1. Scenario.

With respect to general practice issues, physicians were asked about their level of training; ethnicity; practice model; hospital size; and experience with elderly patients, vascular surgery, and invasive hemodynamic monitoring.

Surveys were mailed once in November 2003. Data entry was closed 6 months later. Follow-up mailings were not used. No monetary or raffle-type incentives were used to encourage response.

Differences between respondents and nonrespondents were examined by using 2-sample *t* tests for continuous variables and chi-square tests for categorical variables. Univariate and multivariate ordinal logistic (proportional odds) regression analysis was used to identify physician and patient factors predicting β-blockade use.

β-Blockade use was based on the question "Would you provide prophylactic β-blocker?", with possible answers ranging from "1 = would not recommend" to "5 = strongly recommend" (Table 1). For the purposes of fitting the ordinal logistic regression models, responses of 1 and 2 were combined because of small numbers. Additionally, this outcome was treated as a continuous variable, and linear regression models were fitted. Because conclusions based on these models were similar to those from the ordinal logistic regression models, only results from the latter are reported herein.

The variables with p values <0.15 in univariate models were included in a multivariate model. Likelihood ratio tests were then used to determine which variables could be dropped from the model by using a backward elimination procedure. Interaction terms involving patient characteristics, which had p values <0.15 in univariate models, were added into the model and dropped if not statistically significant at the 0.05 level. Factors associated with HR triggers were assessed by using linear regression or 2-sample t tests.

Values presented are mean ± standard deviation unless otherwise noted. All analyses were performed by using Stata, Version 8 (Stata Corp, College Station, TX).

RESULTS

Of the 2,000 anesthesiologists to whom surveys were mailed, 439 returned them within 6 months (22% response rate). There were several differences between respondents and nonrespondents. Respondents were younger (49.9 ± 8.6 *v* 52.3 ± 10.6 years, $p < 0.0001$, t test). Respondents also had less "experience" (defined as years after transition year) (17.1 ± 9.0 *v* 18.8 ± 10.2 years, $p = 0.0008$, t test). Respondents were also more likely to have graduated from a medical school in the United Sates (80.6% *v* 67.6%, $p < 0.001$, chi-square test).

Respondents were divided into 9 regions: New England (6.6%), Mid-Atlantic (15.3%), South-Atlantic (16.4%), East North Central (18.7%), East South Central (4.8%), West North Central (6.6%), West South Central (8.2%), Mountain (7.1%), and Pacific (16.4%) (Table 2). There was not a significant

Table 1. Responses to Question "Would You Provide Prophylactic β-Blocker?"

	Overall	Race		Age		Sex		Functional Status		Surgery		Health Status	
	(N = 430)	Black (n = 215)	White (n = 215)	65 (n = 214)	85 (n = 216)	Female (n = 201)	Male (n = 229)	Live w/ Daughter (n = 221)	Nursing Home (n = 209)	Medium (n = 219)	Large (n = 211)	Healthy (n = 228)	Sick (n = 202)
1 = would not recommend	12 (2.8)	7 (3.3)	5 (2.3)	9 (4.2)	3 (1.4)	4 (2.0)	8 (3.5)	7 (3.2)	5 (2.4)	7 (3.2)	5 (2.4)	8 (3.5)	4 (2.0)
2	45 (10.5)	16 (7.4)	29 (13.5)	21 (9.8)	24 (11.1)	23 (11.4)	22 (9.6)	28 (12.7)	17 (8.1)	30 (13.7)	15 (7.1)	23 (10.1)	22 (10.9)
3	102 (23.7)	52 (24.2)	50 (23.3)	41 (19.2)	61 (28.2)	39 (19.4)	63 (27.5)	45 (20.4)	57 (27.3)	51 (23.3)	51 (24.2)	53 (23.3)	49 (24.3)
4	174 (40.5)	83 (38.6)	91 (42.3)	93 (43.5)	81 (37.5)	85 (42.3)	89 (38.9)	91 (41.2)	83 (39.7)	84 (38.4)	90 (42.7)	94 (41.2)	80 (39.6)
5 = strongly recommend	97 (22.6)	57 (26.5)	40 (18.6)	50 (23.4)	47 (21.8)	50 (24.9)	47 (20.5)	50 (22.6)	47 (22.5)	47 (21.5)	50 (23.7)	50 (21.9)	47 (23.3)

NOTE. Numbers represent n (%).

Table 2. United States Regions and Response Rates

Region	States	No. of Surveys Sent	Response Rate (%)
New England	CT, ME, MA, NH, RI, VT	114	25.4
Mid-Atlantic	NJ, NY, PA	334	20.1
South-Atlantic	DE, DC, FL, GA, MD, NC, SC, VA, WV	369	19.5
East North Central	IL, IN, MI, OH, WI	312	26.3
East South Central	AL, KY, MS, TN	103	20.4
West North Central	IA, KS, MN, MO, NE, ND, SD	112	25.9
West South Central	AR, LA, OK, TX	198	18.2
Mountain	AZ, CO, ID, MT, NV, NM, UT, WY	132	23.5
Pacific	WA, OR, AK, CA, HI	328	22.0

difference in US geographical region between respondents and nonrespondents ($p = 0.33$, chi-square test).

Sixty-nine physicians reported their race as "nonwhite": 8 black, 4 Native American, 11 Hispanic, and 46 Asian. Forty-one (9.3%) physicians did not report their race.

On univariate analysis (Table 3), white physicians were significantly more likely to recommend β-blockers than other physicians (odds ratio [OR] = 1.74; 95% confidence interval [CI], 1.07-2.85). Physicians who completion of an anesthesia fellowship were also more likely to recommend β-blockers (OR = 1.96; 95% CI, 1.36-2.82). Physicians located in the New England region of the country were significantly more likely to recommend β-blockers than those from other areas (OR = 2.37; 95% CI, 1.22-4.62).

Practice setting also affected the likelihood of self-reported β-blocker use. Physicians who practiced in a community hospital with >500 beds (OR = 3.06; 95% CI, 1.69-5.56), in a government/Veterans Affairs hospital (OR = 5.02; 95% CI, 1.43-17.61), or in a university setting (OR = 2.53; 95% CI, 1.42-4.51) were more likely to recommend β-blockers than those in a community hospital with <250 beds.

No effect was found on responses based on years of experience or frequency of anesthetizing vascular surgery patients. On univariate analysis, physicians who rarely (OR = 0.40; 95% CI, 0.17-0.91) or never (OR = 0.38; 95% CI, 0.15-0.94) placed pulmonary artery catheters or who placed central venous catheters monthly (OR = 0.49; 95% CI, 0.27-0.90) or rarely (OR = 0.49; 95% CI, 0.24-0.98) were less likely to recommend prophylactic β-blockade than those who performed these procedures on a daily basis. Anesthesiologists with >20% of their practice in cardiac anesthesia were more likely to recommend β-blockade than those with no time spent in this area (OR = 2.20; 95% CI, 1.29-3.74). Those in fee-for-service practices were less likely than those with fixed reimbursement to recommend β-blockade (OR = 0.49; 95% CI, 0.30-0.79).

Physician characteristics found to be independent predictors of β-blockade use in a multivariate model (Table 4) were practice setting (>250 beds; OR = 1.60; 95% CI, 1.06-2.42), region (New England *v* others; OR = 2.60; 95% CI, 1.32-5.15), and completion of an anesthesia fellowship (OR = 1.85; 95% CI, 1.27-2.69). Additionally, there was a significant interaction between the effect of a patient's age and health status on β-blockade use. Among healthy patients, β-blockers were somewhat more likely to be recommended for older patients (OR = 1.35, $p = 0.22$). For sick patients, on the other hand, β-blockers were significantly less likely to be used on older patients (OR = 0.59, $p = 0.045$).

Reported HR triggers for providing β-blockade before, during, and after surgery are reported in Table 5. There was a significant difference in preoperative HR triggers between those in New England versus those in other regions ($p = 0.040$) and a significant difference in postoperative HR triggers ($p = 0.017$). No difference in intraoperative HR triggers was found ($p = 0.097$). HR triggers reported by those in New England were lower by ~5 beats/min on average than those from other regions.

With respect to HR triggers, a significant interaction between patient functional status and surgery type was found. For nursing home patients (poor functional status), the mean preoperative HR trigger for β-blockade was similar for both the femoral and aortic surgery groups (90.7 ± 10.8 and 91.1 ± 12.1, respectively; $p = 0.78$). For patients with a good functional status (gardening and living with daughter), the femoral group had a higher mean preoperative HR trigger than the aortic group (92.2 ± 16.4 *v* 87.1 ± 11.7, $p = 0.009$).

Postoperative HR triggers for the use of β-blockade were also different between anesthesiologists who spent 100% of their time in clinical practice versus those who did not (90.5 ± 12.5 *v* 87.8 ± 13.2, $p = 0.044$). Anesthesiologists who said they cared for patients like the one in the scenario "on a daily basis" (12.75% of respondents) reported significantly higher preoperative HR triggers for β-blockade than those who saw such patients less frequently (94.7 ± 19.0 *v* 89.8 ± 11.9, $p = 0.013$).

DISCUSSION

By using a survey strategy, it was found that anesthesiologists recognize the importance of perioperative β-blockade. However, they were no more likely to report use of β-blockade in hypothetical situations in which literature-based guidelines would recommend their use.[12,13] Rather than patient factors, physician factors more often determined the decision.

Factors identified in the literature as relevant to the decision to use perioperative β-blockade were not uniformly applied to the hypothetical patient. Recent American Heart Association/American College of Cardiology guidelines recommend β-blockade for high-risk patients undergoing vascular surgery,[7] and although no target HR is specified, several clinical trials show benefit at a target or obtained HR ≤80 beats/min.[2,3] In the present study, however, the self-reported threshold HR for

Table 3. Univariate Predictors of Perioperative Prophylactic β-Blocker Use

Variable	OR	95% CI	Variable	OR	95% CI
Patient characteristics			Over 85 frequency*		
Race (white *v* black)*	0.73	(0.52, 1.03)	Daily	Referent	
Sex (male *v* female)*	0.78	(0.55, 1.10)	Weekly	1.37	(0.90, 2.10)
Surgery (femoral *v* aortic)*	0.76	(0.54, 1.07)	Monthly/rarely/never	1.01	(0.56, 1.84)
Health (sick *v* healthy)	1.03	(0.73, 1.46)	65-85 frequency		
Function (nursing home *v* gardens)	1.03	(0.73, 1.45)	Daily	Referent	
Age (85 y *v* 65 y)	0.84	(0.59, 1.18)	Weekly	1.02	(0.68, 1.52)
Postop MI likelihood perceived by anesthesiologist*			Monthly/rarely/never	0.81	(0.31, 2.11)
0%-1%	Referent		Arterial catheter frequency*		
1%-5%	1.58	(0.85, 2.96)	Daily	Referent	
5%-10%	1.41	(0.74, 2.67)	Weekly	0.82	(0.50, 1.36)
>10%	2.48	(1.19, 5.16)	Monthly	0.51	(0.29, 0.90)
Death in hospital likelihood perceived by anesthesiologist*			Rarely	0.52	(0.26, 1.05)
0%-1%	Referent		Never	0.73	(0.29, 1.87)
1%-5%	1.48	(0.95, 2.31)	CVP frequency*		
5%-10%	1.03	(0.60, 1.77)	Daily	Referent	
>10%	1.18	(0.49, 2.85)	Weekly	0.75	(0.41, 1.35)
Physician characteristics			Monthly	0.49	(0.27, 0.90)
White race*	1.74	(1.07, 2.85)	Rarely	0.49	(0.24, 0.98)
Female sex	1.19	(0.78, 1.81)	Never	0.78	(0.29, 2.08)
Practice locale			Pulmonary artery catheter frequency*		
Urban	Referent		Daily	Referent	
Suburban	1.03	(0.71, 1.49)	Weekly	0.58	(0.25, 1.34)
Rural and other	1.35	(0.76, 2.38)	Monthly	0.52	(0.22, 1.26)
Reimbursement type*			Rarely	0.40	(0.17, 0.91)
Fixed	Referent		Never	0.38	(0.15, 0.94)
Fee for service	0.49	(0.30, 0.79)	Epidural frequency		
Partnership	0.77	(0.50, 1.17)	Daily	Referent	
Mixed and other	0.84	(0.35, 2.00)	Weekly	0.80	(0.46, 1.42)
Medical school			Monthly	0.62	(0.34, 1.15)
US and Canada	Referent		Rarely	0.54	(0.27, 1.10)
Other	1.04	(0.67, 1.63)	Never	0.72	(0.32, 1.64)
Region of country*			Vascular surgery % of practice		
Other	Referent		0	Referent	
New England	2.37	(1.22, 4.62)	<20	0.74	(0.40, 1.36)
Practice setting*			21-100	0.73	(0.37, 1.45)
<250 beds	Referent		Cardiac surgery % of practice*		
Other	1.74	(1.16, 2.59)	0	Referent	
Practice setting*			<20	1.01	(0.67, 1.51)
<250 beds, community	Referent		21-100	2.20	(1.29, 3.74)
250-500 beds, community	1.23	(0.78, 1.94)	Home same day % of practice		
>500 beds, community	3.06	(1.69, 5.56)	0	Referent	
University	2.53	(1.42, 4.51)	<20	1.77	(0.52, 5.98)
Surgicenter	1.05	(0.47, 2.36)	21-40	0.84	(0.29, 2.41)
Government/VA	5.02	(1.43, 17.61)	41-60	0.79	(0.28, 2.21)
Mixed and other	2.21	(0.71, 6.87)	61-80	0.85	(0.30, 2.40)
Experience*			81-100	0.60	(0.20, 1.86)
0-5 years	Referent		% of patients seen in preoperative clinic		
5-10	1.57	(0.76, 3.24)	0	Referent	
10-15	0.98	(0.48, 2.01)	<20	1.09	(0.66, 1.80)
15-20	0.84	(0.40, 1.76)	21-40	1.24	(0.67, 2.30)
>20	0.90	(0.44, 1.82)	41-60	1.47	(0.72, 2.98)
Anesthesia fellowship*	1.96	(1.36, 2.82)	61-80	1.79	(1.01, 3.17)
Medicare patients frequency			81-100	1.65	(0.93, 2.92)
Daily	Referent		Anesthetize patients described in this scenario frequency		
Weekly	1.01	(0.61, 1.67)	Daily	Referent	
Monthly/rarely/never	0.90	(0.36, 2.22)	Weekly	1.23	(0.72, 2.13)
Medicaid patients frequency			Monthly	1.02	(0.57, 1.85)
Daily	Referent		Rarely	1.23	(0.56, 2.68)
Weekly	1.06	(0.73, 1.54)	Never	2.68	(1.09, 6.62)
Monthly/rarely/never	0.77	(0.44, 1.34)	100% of time in clinical practice	0.77	(0.54, 1.11)

*p Value <0.15 and included in multivariate model fitting.

Table 4. Final Multivariate Ordinal Logistic Regression Model

Variable	OR	95% CI	*p* Value
Patient characteristics			
Age			
65 years old	Referent		
85 years old	1.35	(0.83, 2.19)	0.22
Health status			
Healthy	Referent		
Sick	1.50	(0.91, 2.47)	0.11
Age × health	0.44	(0.22, 0.89)	0.022
Physician characteristics			
Practice setting			
<250 beds	Referent		
Other	1.60	(1.06, 2.42)	0.026
Anesthesia fellowship	1.85	(1.27, 2.69)	0.001
Region			
Other	Referent		
New England	2.60	(1.32, 5.15)	0.006

initiating β-blockade varied with the magnitude of surgery. Specifically, the trigger HRs reported in the present survey were approximately 15 to 20 beats/min higher (ie, 91-92 beats/min on average) for a femoral-distal bypass than the HRs typically recorded in clinical trials showing the cardioprotective effects of β-blockade. Additionally, the mean trigger HRs reported for a femoral-distal bypass were marginally significantly higher than those reported for an aortobifemoral graft procedure. In contrast, severity of patient comorbidities had no effect on trigger HRs, although such comorbidities play an important role in published guidelines. Unfortunately, respondents were queried about HR triggers, not targets, limiting the validity of comparisons of the present results to pivotal randomized controlled trials.

The authors identified several physician-specific factors affecting the self-reported use of β-blockade. Physicians were more likely to recommend perioperative β-blockade if they worked in large hospitals, had received fellowship training, or lived in New England. These results are consistent with results from studies of β-blockade use during nonsurgical treatment for acute myocardial infarction (AMI). In one study, for example, patients with AMI in New England were more likely to receive β-blockade and had better outcomes than patients in other regions of the country.[14] The authors' observation that fellowship-trained anesthesiologists reported a higher likelihood of perioperative β-blocker use is also consistent with studies examining the relationship between level of training and medical management of AMI. In another study, both increased specialization (cardiologists > internists > family practitioners) and board certification were associated with increased rates of β-blockade prescription in AMI.[15] Large hospital size was a predictor of the use of β-blockade in the present survey. Results in the medical literature comparing hospital size and appropriate AMI care are less conclusive, however. In one Swedish study, hospital culture (more *v* less aggressive) was more important than hospital size in predicting appropriate therapy, including β-blockade, in AMI.[16] Another study found that academic medical centers were more likely to provide appropriate pharmacologic therapy, including β-blockade, during AMI than nonteaching hospitals, and that these practices were associated with lower mortality in the teaching hospitals.[17]

Interestingly, physicians who reported caring for patients like the one in the authors' scenario on a daily basis reported a higher preoperative HR trigger for instituting β-blockade than those seeing patients like these less frequently. But anesthesiologists who said that they never care for elderly patients (>85 years) were more likely to use β-blockade in the authors' scenario than those who did care for such patients (data not shown). However, because of the small number of physicians who never cared for elderly patients, the difference did not reach statistical significance. These findings may reflect clinical experience with the potential adverse effects of β-blockade. Familiarity with patients such as those in the authors' scenario may result in a different risk-benefit ratio. Experienced clinicians may recognize the possible complications of overzealous β-blockade in fragile, elderly patients. Although most studies show that perioperative β-blockade is well tolerated, frail 85-year-olds are often not included in such studies, and the effect of clinical experience is rarely a variable. Indeed, in a recent megatrial, the use of early intravenous β-blocker therapy in AMI reduced the risks of reinfarction and ventricular fibrillation but increased the risk of cardiogenic shock.[18]

Changing physician behavior is difficult.[19] Aggressive quality improvement programs incorporating physician feedback have increased the use of appropriate therapies,[20-22] but the results may be ephemeral.[23] It has been suggested that pathways codified with preprinted order sheets or automated reminders built into an electronic medical record might improve appropriate use of perioperative β-blockade,[24] a suggestion that has been refuted.[25] The present data suggest that physician-specific factors may be equally as important as workflow issues or educational quality improvement programs.

The present findings have several limitations. The response rate was 22%. In mail surveys of Canadian anesthesiologists, response rates ranged from 47% to 70%[26-28]; Canadian anesthesiologists may be more willing than US anesthesiologists to reply to surveys as a public service. The authors chose not to use inducements or second mailings to increase response rates but rather relied on mailing a large initial sample of 2,000 surveys. Nonresponse can produce misleading results, however.[29]

The authors randomly sampled anesthesiologists in the United States and cannot draw conclusions about small groups. In this case, stratifying and oversampling (of minority physicians) may have added more clarity.

Finally, the validity and generalizability of some of the key β-blocker trials have been called into question recently. The present data were collected in late 2003 and early 2004; since then, several negative β-blocker trials have been published.

Table 5. "How High Would the Heart Rate Be to Cause You to Give a β-Blocker?"

	N	Mean	SD	Median	Minimum-Maximum
Preoperative	412	90.3	13.1	90	50-200
Intraoperative	416	90.3	13.2	90	60-125
Postoperative	413	89.6	12.8	90	50-120

The Diabetic Postoperative Mortality and Morbidity (DIPOM) trial showed no reduction in cardiac events in 921 patients who received oral metoprolol, 100 mg, extended release or placebo for 4 to 5 days perioperatively; the average HR was reduced by 11% in the treatment group (83 beats/min in placebo to 74 beats/min in metoprolol group on postoperative day 1).[30] The authors concluded that "the evidence is insufficient to recommend perioperative β-blockers for patients at risk of cardiac morbidity." The recent British POBBLE trial, which examined the effects of oral metoprolol on myocardial ischemia (72-hour Holter monitoring) or cardiac events in 103 patients undergoing infrarenal vascular surgery also did not show benefit. Despite the lack of cardioprotection, however, hospital stay was 2 days shorter in the metoprolol group, an important outcome.[31] Lastly, the Metoprolol after Vascular Surgery (MaVS) study enrolled 496 vascular surgery patients in a randomized trial of metoprolol versus placebo.[32] In this study, the average postoperative HR was reduced from 79.1 in the placebo group to 69.4 in the metoprolol group; intraoperative bradycardia and hypotension were more common with metoprolol. They found that metoprolol did not reduce 30-day and 6-month postoperative cardiac event rates. They therefore suggested that "prophylactic use of perioperative β-blockers in all vascular patients is not indicated." However, the study included a majority of patients with regional or combined regional/general anesthetics, and the patient population was relatively healthy.

Other studies support the use of perioperative β-blockade in appropriate surgical patients. In the Coronary Artery Revascularization Prophylaxis trial, routine aggressive medical therapy with β-blockers, statins, and aspirin produced equivalent outcomes in vascular surgery patients when compared with prophylactic coronary revascularization (coronary artery bypass surgery or percutaneous coronary intervention).[6] In a large retrospective study of 663,635 patients, patients with the highest cardiac risk scores benefitted from perioperative β-blockade.[4] In another retrospective study, the use of high-dose β-blockers (6.6 mg/kg of oral metoprolol/day or equivalent) and lower HRs were associated with reduced myocardial ischemia and troponin T release in vascular surgery patients.[33]

The authors believe that at least until the results of the large POISE trial are published,[34] the weight of the evidence favors providing preoperative β-blockade to high-risk vascular surgery patients. Apart from cardioprotection, the authors believe that other beneficial effects of perioperative β-blockade, including the possibility of improved analgesia[35,36] and more rapid recovery from anesthesia,[36] recommend their use. Others have suggested caution in adoption of routine perioperative β-blockade.[37]

The lack of concordance described between literature guidelines and actual physician practice is not surprising. Despite a convincing literature regarding a lack of benefit from the use of albumin,[38] the pulmonary artery catheter,[39,40] and nitric oxide,[41] all are in common use in many medical centers. The present findings with regard to perioperative β-blockade suggest that the discrepancies may not be the result of inadequate education or logistic difficulties but instead the result of physician-specific factors. The fact that fellowship training or the size of the hospital are not explicitly addressed by educational programs or work-flow changes suggest that different techniques may be required to change physician behavior. Such techniques may include identifying subgroups of physicians least likely to follow guidelines, understanding the role of experience in decision-making, identifying patient groups likely to reap the greatest benefit, and identifying mechanisms for the cardioprotective effects of β-blockade. Further research into factors relevant to medical decision-making may form future strategies to promote the use of cardioprotective techniques by anesthesiologists.

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