Can an Academic Health Care System Overcome Barriers to Clinical Guideline Implementation?

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Abstract

While cardiovascular complications remain a leading cause of perioperative morbidity and mortality, studies have shown that prophylactic beta-blocker therapy can reduce the incidence of ischemia, myocardial infarction (MI), and cardiac death. Consensus guidelines and the publication of a recent meta-analysis support the use of perioperative beta-blockade in patients who are at risk for adverse cardiac events, but few studies have examined the practical application of these clinical guidelines. We performed a multicenter intervention study in five acute care hospitals to measure, characterize, and increase the utilization of perioperative beta-blocker therapy for surgical patients at intermediate to high risk of cardiac complications. We also reviewed all cases of perioperative MI. Following baseline observations, we developed a multifaceted educational intervention using grand rounds, academic detailing, and peer profiling to disseminate current guidelines for perioperative beta-blocker use. We then collected postintervention data to assess changes in practice patterns and clinical outcomes. Preliminary results demonstrate a significant underutilization of perioperative beta-blocker therapy among patients at risk for adverse cardiac events, and we have identified several barriers to implementing the guidelines. This paper highlights the lessons learned while implementing a clinical guideline and working to promote an evidence-based intervention aimed at improving patient safety.

Introduction

The publication of clinical practice guidelines has proliferated in recent years as medical decisionmaking and therapeutic options have become increasingly complex. In this setting, practice guidelines have become a tool for providers, organizations, and institutions to define and measure the quality of clinical care. Although various formats have been used, practice guidelines have generally been defined as clinical statements that assist in making appropriate and effective decisions regarding the prevention, treatment, and management of specific health conditions.[1] Despite the abundance of published guidelines, few studies have demonstrated any changes in physician behavior leading to significant and lasting improvements in efficiency or clinical outcomes. Much of the published literature has focused on the dissemination strategies for clinical guidelines.[2–4] However,

little is known about how practice patterns and the barriers to guideline implementation actually change after clinicians become aware of practice guidelines.[5, 6]

In order to more fully understand this process, institutional experience with the implementation of clinical guidelines and barriers to the successful adoption of these recommendations should be explored to examine the relevant factors that may contribute to or accelerate change. In particular, the barriers that are most critical to the successful implementation of a clinical guideline should be identified in order to develop efficient strategies to overcome these difficulties, given limited resources. In this paper, we will describe the lessons learned from the implementation of a clinical guideline for the perioperative administration of beta-blockers across several diverse institutions of an academic health care system.

Background

Reducing perioperative cardiovascular ischemic events through beta-blockade is supported by multiple observational studies and a small number of randomized trials. This strategy has been named as one of 11 specific practices with sufficient evidence regarding patient safety to justify immediate and widespread implementation.[7] The American College of Physicians' position paper on perioperative medicine also concluded that, in the absence of contraindications, patients who meet criteria for cardiovascular risk should receive perioperative beta-blocker.[8] This addendum was incorporated following the publication of a study performed by the Perioperative Ischemia Research Group in which beta-blockade was associated with reduced mortality and a reduction in cardiac events.[9] In addition, a more recent review of the literature endorsed the use of perioperative beta-blocker to prevent cardiac morbidity in select patients. While awaiting the results of additional trials, the authors recommend adopting the Revised Cardiac Risk Index to identify patients who would benefit from prophylaxis.[10]

Although the consensus in the literature regarding the use of perioperative beta-blockade is strong, there is also evidence from studies to suggest that this strategy is underutilized when compared to published guidelines.[11, 12] The reasons underlying the discordance between published guidelines and clinical practice is not well understood. But given these findings, a large opportunity may exist to improve the care of perioperative patients, and further studies are needed to understand the gap between the literature and clinical practice.

Working in collaboration with the New York State Department of Health, a practice guideline for the use of perioperative beta-blockade was developed and implemented with participating hospitals of the New York Presbyterian Health Care System. The guideline was largely adopted from the clinical review by Auerbach and Goldman and then adjusted to meet the needs of the participating hospitals.[10] Medical directors and local opinion leaders were identified at each of the participating hospitals; they met on a weekly basis to share concerns and local

feedback regarding the guideline statement. The departments of nursing and pharmacy provided recommendations concerning the administration and selection of medications. Additionally, providers from surgery, surgical subspecialties, cardiology, and anesthesia participated in the design and implementation of the guideline. After reaching a consensus regarding the guideline statement, each of the involved hospitals conducted a series of educational sessions and provided feedback regarding institution-specific use of perioperative beta-blocker through departmental staff meetings. The utilization of beta-blocker prophylaxis was abstracted from the medical records of surgical patients with risk factors for perioperative cardiac events and all patients who developed a perioperative acute myocardial infarction (AMI) within 48 hours of noncardiac surgery. Baseline utilization and ongoing postintervention measurements were made. The clinical guideline was displayed in physician work areas, and pocket cards describing the risk stratification methodology and recommended medication dosages were disseminated and posted on the hospital Intranet sites. During the educational sessions, a significant amount of time was reserved for questions and feedback regarding the guideline. From these sessions, several barriers were identified relating to provider, patient, and organizational-level factors that contributed independently and jointly to difficulties in the dissemination of this guideline.

Patient factors

Contraindications to beta-blocker use

Relative contraindications to beta-blocker use include congestive heart failure (CHF) or poor ventricular function, bronchospastic disease, symptomatic bradycardia or heart block, and allergies to this class of medications.[13] However, many patients with reactive airway disease may have concomitant conditions such as hypertension or cardiovascular disease that would warrant the use of beta-blockers. A recent meta-analysis of the literature suggests that careful titration of β_1-selective agents is tolerated by many of these patients.[14] However, severe conduction disease or a strong reactive airway component with asthma or chronic obstructive lung disease remains a strong contraindication to beta-blocker use.[15]

We found that among patients who developed a perioperative AMI within 48 hours of surgery, 32 percent (32/100) had contraindications to perioperative beta-blocker use. Despite the relative contraindication, 56 percent (18/32) of these patients still received perioperative beta-blocker prophylaxis, given their overall cardiovascular risk. Among a random sample of patients at intermediate to high risk of perioperative cardiac ischemia given their cardiac risk profile, 24 percent (286/1,198) had contraindications to beta-blockade. However, 51 percent (96/190) received beta-blocking agents despite the risk of bronchospasm. It is unknown to what extent perioperative beta-blocker could have been utilized in the AMI cases that did not receive beta-blockade. The presence of relative contraindications to this class of medication may limit the ability to reduce perioperative events, and

further studies looking at additional agents including alpha 2-agonists are warranted.[16–18]

Risk factors that predict beta-blocker use

The Revised Cardiac Risk Index recommends perioperative beta-blockade for patients who have one major risk factor or two minor risk factors (Table 1). Reviewing patients with intermediate or high risk factors who received perioperative beta-blocker, we learned that some risk factors predicted the administration of beta-blockade more than others. In a multivariate model, established cardiovascular disease (chi-square test 5.31, $P < 0.0001$), hypertension (5.06, $P < 0.0001$), and chronic renal insufficiency (3.14, $P < 0.0017$) were independently associated with the utilization of perioperative beta-blockade. Although not formally included in the Revised Cardiac Risk Index, peripheral vascular disease (4.20, $P < 0.0001$) also predicted the use of beta-blockade. Additionally, we observed that a history of arrhythmia (2.69, $P = 0.007$) predicted perioperative beta-blocker utilization. Finally, we observed a negative correlation between patients with a history of insulin-dependent diabetes (-4.0, $P < 0.0001$) and beta-blockade, despite insulin-dependent diabetes representing a major cardiac risk using the Revised Cardiac Risk Index.

One possible reason for the underutilization of beta-adrenergic blockade among patients with insulin-dependent diabetes may be the concern that warning symptoms of hypoglycemia could be blunted. Despite this longstanding concern, beta-blockade has been repeatedly shown to benefit patients with cardiovascular disease and remains a first-line agent in the treatment of hypertension for patients with and without diabetes. There appears to be discordance between recommended guidelines and the current utilization of perioperative beta-blockade for this group of patients.

Patient participation

Most providers reported that patients infrequently requested information regarding the use of perioperative beta-blocker and were unaware of the benefits of this class of medication in the perioperative setting. Some providers expressed concerns that patients would not accept potential adverse events as a result. Further work to incorporate patients in the decisionmaking process and enhance education in the preoperative evaluation remains an important goal.

Provider factors

Belief in the evidence

One framework that has been proposed to help understand barriers to behavioral change in medicine consists of a sequence of steps that begin with the acquisition of knowledge regarding the recommended practice. After health care providers are made aware of the recommendations, the proposed framework states that opinions and attitudes toward the guideline are formed. Finally, this results in

Table 1. Eligibility criteria for use of perioperative beta-blockers *

1. Minor clinical criteria (any two)

Age ≥ 65 years
Hypertension
Current use of tobacco
Total serum cholesterol ≥ 240mg/dL
Non-insulin dependent diabetes mellitus

2. Revised Cardiac Risk Index Criteria (one or more)

A. High risk surgical procedure:
Intraperitoneal, intrathoracic, or suprainguinal vascular

B. Ischemic heart disease:
History of myocardial infarction
History of angina
Use of sublingual nitroglycerine or oral nitrates
Positive noninvasive cardiac testing
Q waves on electrocardiogram
Symptomatic patients who have undergone PTCA/CABG

C. Cerebrovascular disease:
History of transient ischemic attack
History of cerebrovascular accident

D. Insulin-dependent diabetes mellitus

E. Chronic renal insufficiency:
Creatinine ≥ 2.0mg/dL

*Modified from recommendations given by Auerbach A, Goldman L. B-blockers and reduction of cardiac events in noncardiac surgery: scientific review. JAMA 2002;287:1435–44.

either action or inaction on the part of the provider based upon internal and external constraints.[6] When this framework is applied to the clinical implementation of perioperative beta-blocker, we found that the majority of providers across institutions were already aware of the major studies in the literature supporting its use. This finding agrees with a survey study performed by Canadian anesthesiologists in which the authors found that 95 percent of respondents were aware of the current recommendations, but only 57 percent reported always or usually administering beta-blocker therapy.[19]

Rather than a lack of knowledge regarding the literature, the providers expressed skepticism regarding the strength of the supporting literature. In defense of this position, the American College of Cardiology/American Heart Association (ACC/AHA) practice guidelines state that the utilization of beta-blockers in patients with known coronary disease or major risk factors for coronary disease is a Class IIa indication.[20] This recommendation is given when there is conflicting evidence or a divergence of opinion, but the weight of the evidence is in favor of efficacy. The ACC/AHA guidelines conclude that there are few randomized trials with enough data to allow firm conclusions or recommendations. Others have argued that the safety of perioperative beta-blocker use has not been demonstrated outside of the intensive care

environment.[21] The perioperative medicine literature is currently divided between two conflicting guidelines.[8, 20] Although it is not unexpected that two separate professional bodies working independently would develop different guidelines, clinicians are left to sort through the information and decide how to incorporate these various recommendations into their practices. This direct conflict in practice guidelines is likely to result in inaction on the part of the provider.

The prevailing expert opinion acknowledges that further studies are needed to select patients who will most benefit from perioperative beta-blockade.[22] Additionally, uncertainties surrounding dosages and the times of initiation and discontinuation of this medication persist.[23] Nevertheless, the strength of the supporting opinion for this strategy and the ethical considerations in randomizing at-risk patients to placebo are likely to preclude the completion of future large clinical trials. As a result, ongoing clinical decisions will need to be made in light of the supporting evidence and its limitations.

Slow dissemination

We observed a gradual increase in the use of perioperative beta-blocker prophylaxis across institutions over time that was not specifically correlated with any one component of the intervention. Although the educational components of the intervention were given more frequently in the beginning of the study period, the utilization of beta-blocker prophylaxis continued to increase after the completion of these sessions.

Documentation

As a chart review study, our observations and conclusions are limited to the information that is available in the medical record. Patients who were started on perioperative beta-blocker prophylaxis were identified through progress notes and order forms. However, patients who did not receive beta-blocker prophylaxis despite having cardiovascular risk factors usually had no documentation as to whether beta-blocker prophylaxis was considered or contraindicated. Inferring from the lack of documentation, it would seem that beta-blocker prophylaxis is underprescribed due to lapses in care. This inference may, however, overestimate the number of patients who could potentially benefit from this therapy due to other considerations.

In order to address this issue, several of our participating institutions developed standardized preadmission forms to require documentation for the withholding of beta-blocker prophylaxis among patients with cardiovascular risk factors. The use of these standardized forms also addressed the problem of poor documentation of patient's baseline medications and dosing in many of the reviewed charts. The separation of inpatient and outpatient medical records also contributed to documentation errors in that the presence of a preoperative evaluation was often difficult to determine. While all patients had a documented exam, it was difficult to assess whether a more formal preoperative evaluation had been performed in the outpatient setting and had not been documented in the inpatient chart.

In-hospital evaluation

Prior to the intervention period, most patients who received perioperative beta-blocker prophylaxis had been started on this therapy in the outpatient setting before hospital admission. Among patients without contraindications to beta-blocker who were administered beta-blocker preoperatively, 77 percent (301/392) were receiving this medication by the time of admission. Although beta-blocker prophylaxis was given immediately prior to and following surgery in most patients, fewer patients received the medication continuously throughout their hospital course and discharge. Of particular concern was the finding that a significant number of patients who had indications for beta-blocker usage but who had not already begun therapy as outpatients were not started on beta-blocker therapy after hospital admission. This seems to be a failure in evaluating patients or reevaluating patients in the immediate preoperative time period.

Several concerns were raised regarding the in-hospital initiation of beta-blockade. Providers expressed reluctance to discuss the issue of beta-blockade with primary care physicians and cardiologists after the patient had already been "cleared" for surgery. In addition, surgeons and anesthesiologists articulated uneasiness with communication that might be perceived as questioning the decisionmaking of another physician outside of their specialty. This conflict should also be viewed in light of the importance of the referral relationship.

Concern for adverse events

Studies have shown beta-blocker therapy initiated on the day of surgery results in sustained perioperative risk reduction and necessitates the question of whether a reevaluation for perioperative beta-blocker should be performed at that critical period.[9] This strategy may largely depend on the ability to obtain a complete and accurate medical history in the immediate preoperative setting. The inability to contact providers or review medications would preclude safe decisionmaking regarding the initiation of beta-blocker therapy. Although in the largest study to date there were no adverse events with the administration of intravenous (IV) beta-blocker, other studies have reported an increased incidence of bradycardia and hypotension.[24]

Providers also expressed concern regarding the incidence of adverse events. One issue raised by providers involved administering IV beta-blockade to patients without tachycardia, prior to the administration of anesthetic agents that may result in relative hypotension, particularly in those patients who are relatively hypovolemic. As a result of this concern, many anesthesia providers voiced reluctance in adopting a strategy that would increase the number of patients receiving IV beta-blockers preoperatively and felt that the institution should target primary care providers who could initiate therapy during earlier patient encounters.

Surgical delay

Surgeons voiced other concerns in relation to the potential for delays in initiating surgery due to the need for an increased number of medical consultations. Consultations that are needed during off hours or weekends may be difficult to obtain in some institutions. There is good evidence that delays in certain surgical procedures are correlated with poorer outcomes. Given these considerations, there appears to be a very short window of opportunity in which providers will accept a reevaluation and initiation of prophylactic beta-blocker therapy for patients who did not receive this intervention prior to hospitalization.

Organizational factors

Intravenous administration of medication

Recommendations regarding the administration of perioperative beta-blocker include the initiation of the medication preoperatively, titration of the dose to achieve a target heart rate response, and then continuation of the medication through the hospital stay and longer if adequate follow-up can be arranged.[10] Many patients who are identified as candidates for perioperative beta-blocker therapy may also benefit from the long-term administration of beta-blocker. Studies have shown that select patients have a mortality benefit lasting up to 2 years postoperatively.[9] For some patients with cardiovascular risk factors or established disease, the preoperative evaluation may serve as an intervention to reconsider beta-blocker therapy regardless of the patient's current need for surgery.

For patients who only receive beta-blocker therapy during the perioperative period, however, there is a concern over the abrupt discontinuation of beta-blocker leading to rebound tachycardia and withdrawal. Case reports have shown an association with abrupt beta-blocker discontinuation and an increase in cardiovascular mortality and postoperative myocardial infarction.[25, 26] Continuation of therapy presents logistic difficulties in administering postoperative beta-blocker, as patients frequently do not take oral therapy during the immediate recovery period and potentially longer, depending on the surgical indication. Study protocols have addressed this issue with very intensive postoperative follow-up and strict algorithms regarding the administration of IV beta-blocker to maintain tight heart rate control.[9, 27] Unfortunately, this comprehensive monitoring directed specifically on the titration of IV beta-blocker may not be feasible in many institutions. Additionally, in trial settings the titration of IV beta-blocker is performed in intensive care facilities, although in clinical practice many postoperative patients are transferred to step down units and the general surgical floor while still requiring IV access for infusions and medications.

The safety of this titration protocol may depend on the ability of an organization to provide adequate monitoring. For this reason, many of our

participating hospitals already had guidelines in place regarding the administration of IV beta-blocker. Any attempts at developing clinical guidelines for perioperative beta-blocker need to take into account the organizational structure and ability to safely administer this therapy. Some institutions may need to train additional staff in the safe administration and close surveillance for potential adverse events with IV beta-blocker administration in less monitored settings.

Coordination of care

The majority of patients encountered by our institutions was electively scheduled cases and had encounters with ambulatory providers from medicine, anesthesia, cardiology, and/or surgery prior to arriving on the surgical day. After admission, the patients were then cared for by a series of providers who, in some cases, were meeting the patients for the first time. The process from admission to discharge typically involves a series of handoffs. Given the number of providers who are involved in the care of a perioperative patient, the medical record of those encounters can be the primary means of communication. Yet, in many institutions the outpatient medical records are physically separate from the inpatient charts, making the verbal communication between providers an even more important, though somewhat unreliable, means of transmitting patient information. This is an area in which advancements in the utilization of computer technology to coordinate the care and recommendations of multiple providers may have great impact. Some of our participating institutions had focused admissions units for preoperative evaluation and testing. These centers were specifically targeted to promote the clinical guideline. Even with these centers, however, the coordination between primary provider, surgery, and anesthesia was a necessary and important component of care.

Responsibility for initiation and evaluation

While perioperative medicine has become more evidence based, the debate over which discipline is the primary provider of this care remains controversial.[28, 29] Without clear ownership of this field of medicine, the initiative to evaluate and begin beta-blockers can be lost. Although the Joint Commission on Accreditation of Healthcare Organizations requires all surgical patients to have a documented history and physical examination within 30 days prior to surgery, the components of that documentation are not explicitly defined.[29] A thorough preoperative evaluation goes beyond obtaining a medical history and performing a physical examination, and gives meaningful cardiopulmonary risk assessment as well as recommendations regarding medications, endocarditis, and venous thromboembolism (VTE) prophylaxis where appropriate. The current status of the preoperative evaluation remains highly variable among providers and institutions. Institutions with a combined preadmissions testing center and a standardized cardiopulmonary evaluation form were able to achieve better documentation and a higher level of adherence with perioperative beta-blocker guidelines.

Engagement of department leaders

A critical factor that was identified throughout all of the institutions was the need for strong local administrative backing of the initiative, in addition to a visible physician leader. The most successful institutions had physician leaders who were personally invested in the outcome of the project. The physician leaders were respected clinicians and senior administrators who were able to change behavior on both an individual and departmental level. The lack of a strong message from the local administration regarding the importance of the project to the institution and their own physician leaders led to inconsistent buy-in and the belief that the project was not relevant on the local level. The most successful institutions were able to engage opinion leaders and achieve overall accountability at a departmental level. Strong departmental leadership alone, without overall accountability, led to inconsistent involvement of leaders and a lower adherence to guideline recommendations. Our experience was that a "top-down" approach was most effective in instituting change when the appropriate departmental and opinion leaders believed in the initiative and felt personally responsible for its success or failure.

Feedback of clinical performance

It was important for the participating institutions, as part of a large health care network, to be actively involved in the process and to receive scientifically rigorous feedback on their performance. Individual institutional data were presented in comparison to other, unidentified, member institutions of the network. This internal competition resulted in positive feedback from both the large academic institutions and small community hospitals. Participating institutions voiced the importance of achieving high levels of quality care as a means to improve clinical outcomes. Additionally, institutions described other factors as important drivers of high-quality care, including the need or perceived need to justify increasing costs and the ability to differentiate providers in a tight marketplace. At smaller institutions, achievements in performance that paralleled larger centers resulted in increased incentive to drive change. On a local level, the data feedback was also incorporated into institutional quality improvement projects and demonstrations. In this way, participating in the project and receiving institutional-level data was able to provide a value beyond the project itself and therefore was less likely to be viewed in a punitive manner.

Institutional size and type

The size and teaching mission of the institution did not strongly correlate with the ability to change provider behavior. Prior to the study intervention, academic affiliation did correlate with adherence to recommended clinical guidelines. However, following the intervention period, most institutions achieved approximately the same degree of adherence to guidelines. Institutions with the lowest adherence prior to the study inception were able to demonstrate the greatest change. Across institutions, there appeared to be a ceiling after which the

intervention alone was unable to increase the utilization of perioperative beta-blockade.

Conclusion

Over the course of one year, we worked to implement a clinical guideline for the utilization of perioperative beta-blockade in several of our participating network institutions. Through this process we have achieved modest improvements in the adherence to recommended guidelines. Additionally, in discussions with multiple departmental leaders and local providers, we have identified patient, provider, and institutional barriers to the implementation of the perioperative beta-blockers guideline. Although we have not developed quantitative tools to measure the various limitations described, from a qualitative perspective we found several determinants to be pervasive throughout departments and institutions—namely, skepticism of the supporting literature and difficulty coordinating care, leading to an overall reluctance to initiate therapy and assume responsibility without adequately arranged follow-up.

In light of these barriers, the successful implementation of perioperative guidelines will need to address the current conflicts in the literature. In addition to further research, this could be achieved through the publication of an expert consensus opinion on a national or local level. The use of standardized preadmission order sets would also represent institutional consensus regarding the literature. Finally, the difficulties encountered in the coordination of perioperative care need to be addressed on an institutional level. The use of computerized medical records, preadmissions centers, and the identification and adequate staffing of providers to perform medical consultation services are potential approaches to deal with this complex problem. While the solution to overcoming these barriers will need to be tailored to the capabilities and needs of local institutions, the barriers to guideline implementation remain diffuse. An improved understanding of the underutilization of perioperative beta-blockade is necessary for the successful development of future interventions.

Acknowledgments

The authors thank David Battleman, M.D., M.Sc., Huong Do, M.A., and Ellen Flink, M.B.A., for their extensive work on this project. Ed Hannan, Ph.D., and Brian Gallagher, M.D., also provided invaluable advice and review of the project.

This study was supported through a New York State Department of Health sponsored grant from the Agency for Healthcare Research and Quality.

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