International Journal for Quality in Health Care 2006; **Volume 18, Number 2:** pp. 123–126 10.1093/intqhc/mzi083
Advance Access Publication: 18 October 2005

Quality in Practice

Prevention of perioperative venous thromboembolism and coronary events: differential responsiveness to an intervention program to improve guidelines adherence

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Abstract

Introduction. Prevention of venous thromboembolism and coronary events (with β-blockers) during and after surgery is at the top of a list of safety practices for hospitalized patients, recommended by the Agency for Health Care Research and Quality (AHRQ). We wished to determine and improve adherence to clinical guidelines for these topics in our institution.

Patients, material, and methods. A prospective survey was conducted over several weeks on operated patients in a 1200-beds medical center (a teaching, community and referral hospital in Jerusalem, Israel). Eligibility for and actual administration of prophylactic treatment with anticoagulant and β-blockers were determined. Following an intervention program, which included staff meetings, development of local protocols, and academic detailing by a nurse, the survey was repeated.

Results. In general, adherence to recommended anticoagulation prophylaxis was low, found in only 29% [95% confidence interval (CI) = 23–36] of eligible patients. After the intervention, adequate anticoagulation increased to 50% (95% CI = 40–59) of eligible patients ($P < 0.001$). Initiation of β-blockers in preventing perioperative cardiac events was very low (0%, 95% CI = 0–5%) and did not increase after intervention.

Conclusions. Adherence to guidelines for prevention of surgical complications was found to be low in our institution. A multifaceted intervention significantly increased use of prophylaxis for venous thromboembolism but not for coronary events. This differential response suggests that the success of a quality improvement project strongly depends on topic content and its phase of acceptance.

Keywords: academic detailing, barriers to quality improvement, beta blockers, diffusion of innovations, guidelines adherance, thromboembolism prophylaxis

The Agency for Health Care Research and Quality (AHRQ) recently listed priority practices to improve the safety of hospitalized patients [1], and at the top of this list is the prophylaxis to prevent venous thromboembolism in at-risk patients and the use of perioperative β-blockers. These practices were prioritized because of the strength of evidence regarding their effectiveness and safety, because of their potential impact, and because of their relative ease of implementation [1]. Our institutional Committee for Quality and Safety decided to examine adherence to these recommendations by the AHRQ in our hospitals. This article presents the results of a 2-year survey and of an intervention program.

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Methods

Study setting

The study took place at Hadassah Medical Center, the leading academic institution for the Faculty of Medicine of the Hebrew University of Jerusalem, which operates two sites: a larger (900 beds) hospital (Ein Kerem campus) and smaller (300 beds) hospital (Mount Scopus campus). The study was exempted from the local institutional review board.

Study timeline

During a period of 7 weeks in 2002, data were collected from the operating theater daily logbook on all surgical patients (including general surgery, gynecology, orthopedic surgery, and surgical subspecialties). After several months of intervention, another survey was conducted over another few weeks in the latter half of year 2003, using the same methodology.

Data collection

Presence of eligibility criteria for prophylaxis was recorded, based on recent literature for venous thromboembolism [2] as discussed in chapter 31 of reference [1] and for ischemic heart disease [3] as discussed in chapter 25 of reference [1], including the absence of contra-indications to prophylaxis as summarized in Table 1. The rate of each prophylaxis usage was calculated from the total number of eligible patients, without contra-indications, who actually received it.

Intervention

As prophylaxis utilization was found to be low, an intervention was designed and included (i) presentation and discussion of the data with a review of the literature at staff meetings of surgery, gynecology, and anesthesiology; (ii) development of local protocols, adapted from recommendations by professional agencies [1] in agreement with senior cardiologist (DG), hematologist (DV), anesthesiologists, and surgeons, and approved by department heads; (iii) academic detailing: for several months during the first half of 2003, a nurse was available to the ward staff in Ein Kerem to identify untreated patients at risk and, using face-to-face encounters with physicians, to discuss the recommendations and encourage their implementation. The Surgery Department at Mount Scopus was not exposed to any intervention and was used as a control group. The Gynecology Department at Mount Scopus shares all educational and administrative activities with the Gynecology Department at Ein Kerem and therefore received a partial intervention based on [i] and [ii] but without academic detailing.

As this work was designed to measure processes rather than outcomes [4], no attempt was made to examine incidence of venous thromboembolism or coronary events—for which a meaningful evaluation would have required a much larger sample. Likewise, no systematic attempt was made to examine side effects from treatment. Because observations in our hospitals revealed that early ambulation after surgery was the rule while use of intermittent pneumatic compression was the exception, no quantitative evaluation of these preventive measures was carried out.

Table 1 Criteria for eligibility to venous thromboembolism or β-blocker prophylaxis

Criteria for eligibility to venous thromboembolism prophylaxis
Age (>40, especially >60)
Major surgery
Previous or family history of venous thromboembolism
Overweight
Mobility impairment
Smoking
Cancer
Cardiac failure
Nephrotic syndrome and inflammatory bowel disease
Estrogens usage and postpartum state
Absence of any of the following contra-indications: active bleeding; epidural or spinal anesthesia; allergy to heparin; and thrombocytopenia
Criteria for eligibility to β-blocker prophylaxis
Documented history of ischemic heart disease (previous myocardial infarction, positive exercise test, or thallium scan)
High risk for ischemic heart disease based on two of the following
Age > 65
Diabetes mellitus
Hypertension
Smoking
High blood cholesterol (>6 mmol/L)
Renal failure (blood creatinine > 200 μmol/L)
Especially before large, intraabdominal, intrathoracic, or vascular surgery
Absence of any of the following contra-indications: asthma; bradycardia; high degree (II or III) AV block; carotid sinus hypersensitivity; uncontrolled cardiac failure; and blood pressure < 100 mmHg

Results

Venous thromboembolism prophylaxis

Before the intervention, out of 704 operated patients, 241 were found eligible for venous thromboembolism prophylaxis and less than half of these patients received prophylaxis (generally with low molecular weight heparin, enoxaparin). As summarized in Table 2, except for orthopedics, where prophylaxis usage was close to 100%, in all other departments, prophylaxis usage was lower than 50% and even lower than 20% in gynecology. When used, prophylaxis was mostly given to high or very high-risk patients as defined in [2].

Table 2 Use of venous thromboembolism prophylaxis before and after intervention

Department	Number of patients screened, eligible, and receiving prophylaxis			Rate of prophylaxis (%)
	Screened	Eligible	Receiving	
Surgery A				
Before	61	30	8	27
After	61	25	15	60[1]
Surgery B				
Before	91	45	22	49
After	77	37	19	52
Gynecology EK				
Before	163	30	5	17
After	113	18	8	45[2]
Gynecology MS				
Before	144	17	3	18
After	149	25	10	40[3]
Total				
Before	651	203	59	29
After	400	105	52	50[1]
Departments not exposed to intervention				
Orthopedics	53	38	37	97
Surgery MS				
First period	192	81	21	26
Second period	61	38	9	24

[1] $P < 0.001$.
[2] $P < 0.05$.
[3] $P < 0.1$.
EK, ein kerem; MS, mount scopus.

Departments with a rate of venous thromboembolism prophylaxis usage lower than 50% were targeted by the intervention. As summarized in Table 2, the rate of prophylaxis increased in most departments exposed to the intervention from an average of 29 [95% confidence interval (CI) = 23–36] to 50% (95% CI = 40–59) ($P < 0.001$). At the same time, the rate of prophylaxis in surgery Mount Scopus (MS), not exposed to any intervention, remained low.

Beta-blockers prophylaxis

A preintervention survey, among 602 patients that were operated in our medical center, found 75 patients eligible for perioperative prophylactic treatment with β-blockers: 18 had known coronary artery disease and 57 had at least two risk factors for it. None of these patients began receiving such treatment. On the other hand, in all 43 patients routinely taking β-blockers before surgery, this treatment was not discontinued.

After the intervention, no significant difference was noted: a repeated survey of 475 patients undergoing non-cardiac operations found 72 patients eligible for perioperative prophylactic treatment with β-blockers (18 had known coronary artery disease and 54 had at least two risk factors for it). Again, none of these patients began receiving such treatment.

Discussion

We found low compliance with two priority patient safety practices advised by the AHRQ [1]. After a multifaceted intervention, the rate of venous thromboembolism prophylaxis usage significantly rose from 29 to 50% of eligible patients. Suboptimal venous thromboembolism prophylaxis is common [4–8] and, as shown by others, can be improved by active enforcement [4,8]. By contrast, the perioperative use of β-blockers was essentially non-existent and did not increase after the intervention.

We were surprised by the resilience to change with regard to the use of perioperative β-blockers: although the medical staff knew and generally accepted the recommendations, they did not implement them (except that β-blockers were not discontinued). One department head even said: 'it is easy: when you stop aspirin before an elective operation, start atenolol'. Medical students reported that surgeons began asking them at exams about perioperative use of β-blockers. The Head of Surgery in the Ein Kerem Campus notified one of us (MB) about new literature reports on the value of perioperative β-blockers. Recognition of the issue was not sufficient to lead to implementation of a guideline.

Discussion with physicians confirmed what others have reported about underutilization of perioperative β-blockers, ascribing it to doubts about efficacy, concern of adverse

drug effects, and reluctance to change [9]. An additional reason may be the equivocal responsibility for implementation: the surgeon thinks this is a problem for cardiologists or internists (who do not see most of the patients) or for anesthesiologists (who see the patients too late). Another reason, also true for venous thromboembolism prophylaxis, is the need for the clinician to recognize multiple risks and contra-indications of the treatment (Table 1) for which a computer-based reminder might be useful [10].

Lack of physician concordance with guidelines has been recognized and analyzed [11]. Types of intervention programs and their success rates to improve guidelines adherence vary considerably [12–15]. Our study shows differential uptake of guidelines by identical teams, under comparable conditions and following a similar intervention. Our results suggest that implementation of a guideline largely depends on its content and phase of acceptance. Venous thromboembolism prophylaxis, largely known and already in use to a variable extent, was boosted by our intervention by mode of reinforcement. Perioperative usage of β-blockers, a relatively new idea [3] largely unknown to our teams before the start of our project, was unchanged by our intervention, probably at least in part because physicians were at earlier phases of guideline learning, including lack of awareness, familiarity, or agreement [11]. Our observations gave us an opportunity to look at two different stages in the diffusion of innovations [16].

Within the venous thromboembolism prophylaxis, we also observed a differential response to our intervention, as summarized in Table 2. Improvement was obvious in Surgery A (where baseline usage was low), but not in Surgery B (where baseline usage was high), perhaps because physicians in Surgery B felt more complacent or because of a 'ceiling' effect (whereby administration of enoxaparin to low-risk patients raises more concerns about adverse effects versus benefits). Of note, as summarized in Table 2, within the same Division of Gynecology, comparable degrees of improvement were noted in the Ein Kerem campus, with academic detailing, as in Mount Scopus campus, without academic detailing. It is possible that the development and promulgation of a local division protocol was the main cause for the improvement noted in this setting, regardless of the help from the visiting nurse. This study emphasizes the need for more research to better understand and utilize successful modalities for implementation of clinical guidelines.

Acknowledgement

Ms Ilana Gross, B.Sc., R.N., provided excellent help in academic detailing and data collection. A. Grupper, A. Grupper and D. Rudin were medical students at the time of the study, which was performed as part of their MD thesis.

References

1. Shojania KG, Duncan BW, McDonald KM, eds. *Making Health Care Safer: A Critical Analysis of Patient Safety Practices*. Evidence Report/Technology Assessment No. 43. AHRQ Publication No. 01-E058. Rockville, MD, USA: Agency for Healthcare Research and Quality, 2001.
2. Geerts WH, Heit JA, Clagett GP *et al.* Prevention of venous thromboembolism. *Chest* 2001; **119 (suppl. 1):** 132S–175S.
3. Fleisher LA, Eagle KA. Clinical practice. Lowering cardiac risk in noncardiac surgery. *N Engl J Med* 2001; **345 (23):** 1677–1682.
4. Audet AM, Anderson FA, St John R. The prevention of venous thromboembolism: a statewide evaluation of practices in Massachusetts. *Therapie* 1998; **53 (6):** 591–594.
5. George BD, Cook TA, Franklin IJ, Nethercliff J, Galland RB. Protocol violation in deep vein thrombosis prophylaxis [comments]. *Ann R Coll Surg Engl* 1998; **80 (1):** 55–57.
6. Arnau JM, Vallano A, Boveda JL, Gallofre M, Permanyer G, Bartoli JP. Assessment of the performance of deep vein thrombosis prophylaxis in a general hospital after the dissemination of a local protocol [abstract]. *Annu Meet Int Soc Technol Assess Health Care* 1999; **15**: 132.
7. Hiremath VS, Gaffney G. Audit of thromboprophylaxis following caesarean section. *Ir Med J* 2000; **93 (8):** 234–236.
8. Huang A, Barber N, Northeast A. Deep vein thrombosis prophylaxis protocol – needs active enforcement. *Ann R Coll Surg Engl* 2000; **82 (1):** 69–70.
9. Siddiqui AK, Ahmed S, Delbeau H, Conner D, Mattana J. Lack of physician concordance with guidelines on the perioperative use of beta-blockers. *Arch Intern Med* 2004; **164 (6):** 664–667.
10. Schunemann HJ, Cook D, Grimshaw J *et al.* Antithrombotic and thrombolytic therapy: from evidence to application: the seventh ACCP conference on antithrombotic and thrombolytic therapy. Experimental and quasi-experimental designs for evaluating guideline implementation strategies. *Chest* 2004; **126 (suppl. 3):** 688S–696S.
11. Cabana MD, Rand CS, Powe NR *et al.* Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA* 1999; **282 (15):** 1458–1465.
12. Walker A, Campbell S, Grimshaw J. Implementation of a national guideline on prophylaxis of venous thromboembolism: a survey of acute services in Scotland. Thromboembolism Prevention Evaluation Study Group. *Health Bull (Edinb)* 1999; **57 (2):** 141–147.
13. Gross PA, Greenfield S, Cretin S *et al.* Optimal methods for guideline implementation: conclusions from Leeds Castle meeting. *Med Care* 2001; **39 (8 suppl. 2):** II85–II92.
14. Grol R. Successes and failures in the implementation of evidence-based guidelines for clinical practice. *Med Care* 2001; **39 (8 suppl. 2):** II46–II54.
15. Grimshaw JM, Shirran L, Thomas R *et al.* Changing provider behavior: an overview of systematic reviews of interventions. *Med Care* 2001; **39 (8 suppl. 2):** II2–II45.
16. Rogers EM. *Diffusion of Innovations*, fifth edition. New York: Free Press, 2003.

Accepted for publication 18 September 2005