

We acknowledge limitations to this study. Because sinusitis is diagnosed based on physical examination findings and symptoms, data not captured in NAMCS/NHAMCS, we were unable to determine which patients had acute bacterial sinusitis as strictly defined based on the criteria suggested by recent clinical guidelines.⁷ We were also not able to determine if patients receiving antibiotic treatment had recurrent sinusitis or had previously experienced treatment failure with narrow-spectrum therapy for sinusitis, either of which might have made prescription of a broad-spectrum agent acceptable. Previous studies have suggested, however, that bacterial sinusitis composes a relatively small fraction of acute sinusitis cases seen in primary care, and treatment failure is also uncommon.^{3,4} We were also unable to determine which patients had an allergy to recommended agents.

This study highlights that prescribing of broad-spectrum antibiotics for sinusitis, especially quinolones and macrolides, is extremely common. This is an important target for antimicrobial stewardship efforts partially because the benefits of antibiotic therapy are limited. Qualitative research to explore the health care provider and patient attitudes that influence antibiotic selection is a next step to understanding the problem. Also critically important are adoption of clinical guidelines that promote appropriate antibiotic use.⁷ Changes in prescribing behavior of health care providers for sinusitis are urgently needed to improve health care quality and stem the rising tide of antibiotic resistance in the United States.

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1. Sharp HJ, Denman D, Puumala S, Leopold DA. Treatment of acute and chronic rhinosinusitis in the United States, 1999-2002. *Arch Otolaryngol Head Neck Surg.* 2007;133(3):260-265.
2. Hickner JM, Bartlett JG, Besser RE, Gonzales R, Hoffman JR, Sande MA; American Academy of Family Physicians; American College of Physicians-American Society of Internal Medicine; Centers for Disease Control; Infectious Diseases Society of America. Principles of appropriate antibiotic use for acute rhinosinusitis in adults: background. *Ann Intern Med.* 2001;134(6):498-505.
3. Smith SR, Montgomery LG, Williams JW Jr. Treatment of mild to moderate sinusitis. *Arch Intern Med.* 2012;172(6):510-513.
4. Garbutt JM, Banister C, Spitznagel E, Piccirillo JF. Amoxicillin for acute rhinosinusitis: a randomized controlled trial. *JAMA.* 2012;307(7):685-692.
5. Brooks I, Gooch WM III, Jenkins SG, et al. Medical management of acute bacterial sinusitis: recommendations of a clinical advisory committee on pediatric and adult sinusitis. *Ann Otol Rhinol Laryngol Suppl.* 2000;182:2-20.
6. Rosenfeld RM, Andes D, Bhattacharyya N, et al. Clinical practice guideline: adult sinusitis. *Otolaryngol Head Neck Surg.* 2007;137(3)(suppl):S1-S31.
7. Chow AW, Benninger MS, Brook I, et al. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. *Clin Infect Dis.* 2012;54(8):e72-e112.
8. Klugman KP. Clinical impact of antibiotic resistance in respiratory tract infections. *Int J Antimicrob Agents.* 2007;29(suppl 1):S6-S10.
9. Weber SG, Gold HS, Hooper DC, Karchmer AW, Carmeli Y. Fluoroquinolones and the risk for methicillin-resistant *Staphylococcus aureus* in hospitalized patients. *Emerg Infect Dis.* 2003;9(11):1415-1422.

Periprocedural Management of the Patient With Diabetes Mellitus Undergoing Coronary Angiography: Current Practice

Despite advances in procedural technique and pharmacotherapy, patients with diabetes mellitus (DM) experience worse outcomes than patients without DM undergoing percutaneous coronary intervention (PCI).¹ Periprocedural hyperglycemia is associated with adverse clinical outcomes in patients undergoing PCI,²⁻⁵ and studies have suggested that treating periprocedural hyperglycemia may improve outcomes by attenuating glucose-mediated ischemic injury at the time of PCI.^{6,7} Simple preventive strategies, such as continuing long-acting hypoglycemic medications, have not been evaluated, and there are no guidelines for periprocedural use of these medications.

We conducted an anonymous electronic survey of cardiologists referring patients for coronary angiography using the American Heart Association Cardiology Fellows Society of Greater New York and the Society of Cardiovascular Angiography and Interventions from March through July 2011. Of the 144 survey responders, 24% were fellows-in-training, and 33% were faculty at a medical school. Among this cohort, 60% believed that hyperglycemia at the time of PCI is harmful, and 94% believed that hypoglycemia at the time of PCI is harmful.

Although most clinicians routinely hold oral hypoglycemic medications prior to angiography, substantial numbers do not, with nearly half routinely continuing thiazolidinediones on the morning of coronary angiography (**Table**). Clinicians are more likely to continue insulin-based regimens than oral medications, but again there is no uniformity of practice. In patients with uncontrolled DM (glycosylated hemoglobin level >10% or blood glucose levels >200 mg/dL), a little more than one-third of physicians reported they would change their usual practice and continue hypoglycemic medications prior to coronary angiography. (To convert glycosylated hemoglobin to a proportion of total hemoglobin, multiply by 0.01; to convert serum glucose to millimoles per liter, multiply by 0.0555.)

Table. Clinicians Reporting Routine Holding of Hypoglycemic Medications Prior to Coronary Angiography^a

Sulfonylurea	Metformin	Thiazolidinedione	NPH-Insulin		NPH Component of 70/30 Insulin ^b	Glargine-Insulin	
			Hold Dose	Continue Half-Dose		Hold Dose	Continue Half-Dose
70 (39)	88 (12) ^c	55 (34)	26 (35)	72 ^d	63 (55)	16 (32)	60 ^d

Abbreviations: DM, diabetes mellitus; NPH, neutral protamine Hagedorn.

^aData are presented as percentage of survey responders who report routinely holding hypoglycemic medications prior to procedure in patients with DM referred for coronary angiography (percentage of those who routinely hold but will continue medication in uncontrolled DM, defined as glycosylated hemoglobin level >10% or blood glucose levels > 200 mg/dL [to convert glycosylated hemoglobin to a proportion of total hemoglobin, multiply by 0.01; to convert serum glucose to millimoles per liter, multiply by 0.0555]).

^b70/30 Insulin consists of 70% long-acting NPH and 30% short-acting or rapid-acting insulin.

^cTwenty-eight percent of survey responders hold metformin for 48 hours before and 48 hours after procedure.

^dSurvey responders who report continuing half-dose insulin prior to procedure were not asked if they would change their strategy in patients with uncontrolled DM.

The risk of hypoglycemia seems to be a major factor preventing physicians from continuing long-acting hypoglycemic medications prior to PCI. Delays in scheduled cardiac catheterization procedures frequently occur, and, therefore, uncertainty exists regarding how long a patient will be fasting prior to his or her coronary angiogram. However, hypoglycemia is not likely to complicate routine coronary angiography because patients with a procedure scheduled for late afternoon are usually given permission to have a light breakfast and to eat relatively soon after the procedure is completed even when conscious sedation is administered. Furthermore, there is substantial variability in eating patterns and stress levels on the day of PCI, which may lead to hyperglycemia at the time of arterial access. This may explain why most physicians report continuing at least half the dose of long-acting insulin in all patients with DM prior to angiography.

Our data suggest that physicians are influenced by the pharmacologic properties of the various hypoglycemic agents when designing management strategies for patients with DM undergoing coronary angiography. For example, thiazolidinediones and glargine-insulin are unlikely to cause sudden hypoglycemia in the setting of variable eating patterns. Physicians are, therefore, less likely to hold thiazolidinediones compared with sulfonylureas prior to cardiac catheterization. Similarly, physicians are more likely to continue full-dose glargine-insulin than neutral protamine Hagedorn (NPH)-insulin on the day of coronary angiography. Thus, it is a cause for concern that the management of patients treated with metformin reflects a lack of knowledge of the pharmacologic properties of this drug. Metformin is contraindicated in patients with chronic kidney disease owing to the risk of lactic acidosis at very high metformin concentrations. However, in patients with normal kidney function, renal function is unlikely to change following angiography unless contrast-induced nephropathy develops, a complication that occurs 48 to 72 hours after contrast exposure. The half-life of metformin is 2 to 5 hours, and, therefore, the drug label instructs patients to stop the medication for 48 hours *after* contrast exposure. Nevertheless, 88% of physicians in the current survey report holding metformin prior to coronary angiography. Furthermore, of these physicians, 28% report holding metformin for both 2 days before and 2 days after coronary angiography.

Although the response rate to this survey was low, and we have no data on nonresponders, we obtained a sample of physicians at various stages of practice, including fellows-in-training and attending physicians, in both private practice and academics. Survey responders may also have self-selecting features. For example, only those who believe this is an important topic of discussion may have responded to the survey. However, we still demonstrate clinical equipoise in the management of hypoglycemic medications in the patient with DM undergoing coronary angiography.

We conclude that there is considerable variability in the management of hypoglycemic medications by cardiologists sending patients for coronary angiography. An evidence base to better establish optimal goals for glycemic control in the setting of PCI and education of physicians to avoid premature discontinuation of DM therapies is needed. Furthermore, prospective randomized studies are warranted to determine if continuing long-acting hypoglycemic medications prior to PCI is safe and has a beneficial effect on long-term clinical outcomes.

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1. Mathew V, Gersh BJ, Williams BA, et al. Outcomes in patients with diabetes mellitus undergoing percutaneous coronary intervention in the current era: a report from the Prevention of REStenosis with Trilast and its Outcomes (PRESTO) trial. *Circulation*. 2004;109(4):476-480.
2. Muhlestein JB, Anderson JL, Horne BD, et al; Intermountain Heart Collaborative Study Group. Effect of fasting glucose levels on mortality rate in patients with and without diabetes mellitus and coronary artery disease undergoing percutaneous coronary intervention. *Am Heart J*. 2003;146(2):351-358.
3. Robertson BJ, Gascho JA, Gabbay RA, McNulty PH. Usefulness of hyperglycemia in predicting renal and myocardial injury in patients with diabetes mellitus undergoing percutaneous coronary intervention. *Am J Cardiol*. 2004;94(8):1027-1029.
4. Wilson SR, Vakili BA, Sherman W, Sanborn TA, Brown DL. Effect of diabetes on long-term mortality following contemporary percutaneous coronary intervention: analysis of 4,284 cases. *Diabetes Care*. 2004;27(5):1137-1142.
5. Shah B, Liou M, Grossi E, et al. Relation of elevated periprocedural blood glucose to long-term survival after percutaneous coronary intervention. *Am J Cardiol*. 2005;96(4):543-546.
6. Corpus RA, George PB, House JA, et al. Optimal glycemic control is associated with a lower rate of target vessel revascularization in treated type II diabetic patients undergoing elective percutaneous coronary intervention. *J Am Coll Cardiol*. 2004;43(1):8-14.
7. Yazici M, Demircan S, Durna K, Yasar E, Acar Z, Sahin M. Effect of glucose-insulin-potassium infusion on myocardial damage due to percutaneous coronary revascularization. *Am J Cardiol*. 2005;96(11):1517-1520.

Caregivers' Perceptions of Patients as Reminders to Improve Hand Hygiene

Hand hygiene is widely regarded as the most important measure to prevent health care-associated infections and limit the spread of antimicrobial resistance,^{1,2} but health care worker (HCW) compliance remains low.² Successful strategies to improve compliance result from a combination of multiple components, including system change, training, and education of HCWs; observation and performance feedback; reminders in the workplace; and the institution of a safety climate.^{2,3} A promising, albeit less explored, avenue is to encourage patients to remind HCWs to perform hand hygiene before caring for them.⁴ This strategy has been recommended by a large number of organizations and authorities worldwide, including the World Health Organization² and the US Centers for Disease Control and Prevention.⁵ However, very little is known about HCWs' views of such programs.⁴ We surveyed a sample of HCWs to investigate the degree to which

they wish to be reminded by patients to perform hand hygiene and to identify sociodemographic variables and beliefs influencing their views.

Methods. We conducted a cross-sectional study in 2009 to assess HCWs' perceptions of a hypothetical patient participation program to improve staff compliance with hand hygiene at the University of Geneva Hospitals (HUG), Geneva, Switzerland. An anonymous, confidential survey was sent to the home address of 700 randomly selected HCWs. Attitudes and beliefs were assessed using a Likert scale ranging from 1 (strongly agree) to 5 (strongly disagree). We evaluated also the level of acceptance of wearing a badge to invite patients to ask about hand hygiene, previously suggested to be a powerful patient incentive.⁶ Variables associated with support of patient inquiry were assessed through univariate and multivariate logistic regression. Answers were dichotomized to simplify reporting. We performed a forward stepwise logistic regression procedure introducing one by one all covariates using $P < .05$ for entry. We presented a parsimonious model including all covariates significantly associated with support of patient inquiry to improve hand hygiene. All tests were 2-sided, and $P < .05$ indicated statistical significance.

Results. Of the 277 respondents (response rate, 41.4%), 44% were physicians, and 56% were nurses; 65% had more than 10 years' work experience. Only 3% had been asked by a patient whether they had cleansed their hands before being cared for in the previous month. Although 74% believed that patients could help to prevent health care-associated infections, 29% of respondents did not support the idea of being reminded by patients to perform hand hygiene, 27% believed that such an inquiry is not part of the patients' role, and 37% would not consent to wear a badge inviting patients to ask about hand hygiene. Seventy respondents (26%) considered that inviting patients to inquire about staff hand hygiene would be too time consuming, 17% believed that patient inquiry would be upsetting, and 27% felt that it would be humiliating. Forty-four percent admitted to a feeling of guilt if patients discovered that they omitted hand hygiene, and 43% would be ashamed to disclose that they forgot to cleanse their hands. Forty-six percent feared that acknowledging omission could stir patient anger, and 26% believed that it would make them seem inept. Interestingly, 18% feared that admitting their omission to perform hand hygiene could lead to legal action.

By multivariate analysis (**Table**), endorsement of patient inquiry was independently associated with the beliefs that patients can help prevent medical errors and that patient inquiry can improve HCWs' hand hygiene behavior. By contrast, endorsement was inversely associated with the belief that omitting hand hygiene is inconsequential, the perception that patient inquiry would be humiliating to HCWs, and that such a strategy would call into question their competency.