

## NATIONAL QUALITY FORUM—Evidence (subcriterion 1a)

**Measure Number** (if previously endorsed): 0272

**Measure Title:** [Diabetes Short-Term Complications Admission Rate \(PQI 01\)](#)

**IF the measure is a component in a composite performance measure, provide the title of the Composite Measure here:** [Click here to enter composite measure #/ title](#)

**Date of Submission:** [2/24/2014](#)

### Instructions

- **For composite performance measures:**
  - A separate evidence form is required for each component measure unless several components were studied together.
  - If a component measure is submitted as an individual performance measure, attach the evidence form to the individual measure submission.
- Respond to all questions as instructed with answers immediately following the question. All information needed to demonstrate meeting the evidence subcriterion (1a) must be in this form. An appendix of supplemental materials may be submitted, but there is no guarantee it will be reviewed.
- If you are unable to check a box, please highlight or shade the box for your response.
- Maximum of 10 pages (*includes questions/instructions*; minimum font size 11 pt; do not change margins).  
**Contact NQF staff if more pages are needed.**
- Contact NQF staff regarding questions. Check for resources at [Submitting Standards webpage](#).

**Note:** The information provided in this form is intended to aid the Steering Committee and other stakeholders in understanding to what degree the evidence for this measure meets NQF's evaluation criteria.

### 1a. Evidence to Support the Measure Focus

The measure focus is evidence-based, demonstrated as follows:

- **Health outcome:** <sup>3</sup> a rationale supports the relationship of the health outcome to processes or structures of care. Applies to patient-reported outcomes (PRO), including health-related quality of life/functional status, symptom/symptom burden, experience with care, health-related behavior.
- **Intermediate clinical outcome:** a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence <sup>4</sup> that the measured intermediate clinical outcome leads to a desired health outcome.
- **Process:** <sup>5</sup> a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence <sup>4</sup> that the measured process leads to a desired health outcome.
- **Structure:** a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence <sup>4</sup> that the measured structure leads to a desired health outcome.
- **Efficiency:** <sup>6</sup> evidence not required for the resource use component.

### Notes

3. Generally, rare event outcomes do not provide adequate information for improvement or discrimination; however, serious reportable events that are compared to zero are appropriate outcomes for public reporting and quality improvement.
4. The preferred systems for grading the evidence are the U.S. Preventive Services Task Force (USPSTF) [grading definitions](#) and [methods](#), or Grading of Recommendations, Assessment, Development and Evaluation ([GRADE](#)) [guidelines](#).
5. Clinical care processes typically include multiple steps: assess → identify problem/potential problem → choose/plan intervention (with patient input) → provide intervention → evaluate impact on health status. If the measure focus is one step in such a multistep process, the step with the strongest evidence for the link to the desired outcome should be selected as the focus of measurement. Note: A measure focused only on collecting PROM data is not a PRO-PM.
6. Measures of efficiency combine the concepts of resource use and quality (see NQF's [Measurement Framework: Evaluating Efficiency Across Episodes of Care](#); [AQA Principles of Efficiency Measures](#)).

**1a.1. This is a measure of:** *(should be consistent with type of measure entered in De.1)*

Outcome

- ☒ Health outcome: Click here to name the health outcome
- ☐ Patient-reported outcome (PRO): Click here to name the PRO  
*PROs include HRQoL/functional status, symptom/symptom burden, experience with care, health-related behaviors*
- ☐ Intermediate clinical outcome (e.g., lab value): Click here to name the intermediate outcome
- ☐ Process: Click here to name the process
- ☐ Structure: Click here to name the structure
- ☐ Other: Click here to name what is being measured

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**HEALTH OUTCOME/PRO PERFORMANCE MEASURE** *If not a health outcome or PRO, skip to [1a.3](#)*

**1a.2. Briefly state or diagram the path between the health outcome (or PRO) and the healthcare structures, processes, interventions, or services that influence it.**

Common short-term complications of diabetes mellitus (diabetes) include diabetic ketoacidosis (DKA), hyperosmolarity (also known as hyperglycemic hyperosmolar nonketonic syndrome (HHNS)), and coma. These life-threatening events are due to excess glucose (DKA and hyperosmolarity) or insulin (coma) as result of poor glycemic control. Precipitating events leading to hospital admission for diabetic complications may include physiologic causes, the cessation of treatment, lack of access to care, or other adherence issues. Hospitalizations related to short complications of diabetes may be avoided by better disease management and improved diabetic screening.

**1a.2.1. State the rationale supporting the relationship between the health outcome (or PRO) to at least one healthcare structure, process, intervention, or service (i.e., influence on outcome/PRO).**

*Note: For health outcome/PRO performance measures, no further information is required; however, you may provide evidence for any of the structures, processes, interventions, or service identified above.*

The cornerstone of diabetic disease management, and thus the prevention of short-term complications of diabetes, is glycemic control. Despite medical advances and increased awareness of diabetes in both the lay and medical communities, few patients with diabetes broadly achieve targets for glucose management and other preventative care interventions, as outlined in nationally accepted clinical guidelines (See section 1.a.3 and 1.a.4). Better glycemic control can be achieved through: higher access to medical care in the ambulatory setting; appropriate medication and home glucose monitoring; better care coordination among providers; proper nutrition; patient education and improved self-management (including sick day management and early symptom activation); and treatment or co-management of comorbid mental illness. Preventing hospitalization for complications associated with de novo cases can be achieved through better diabetic screening programs and earlier treatment of disease. The the US Preventive Services Task Force, the Agency for Healthcare Research and Quality (AHRQ) has outlined additional research to examine the effectiveness of screening for Type 2 diabetes mellitus, impaired fasting glucose and impaired glucose tolerance (<http://www.uspreventiveservicestaskforce.org/uspstf13/type2/type2finalresplan.htm>)

These clinical practice guidelines suggest that short-term complications are preventable and, thus, hospitalizations for these short-term complications are preventable.

Ref:

American Diabetes Association. Standards of Medical Care in Diabetes – 2014. *Diabetes Care*. 2014;37(suppl 1): S14-S78.

Robbins JM, Thatcher GE, Webb DA, Valdmanis VG. Nutritionist visits, diabetes classes, and hospitalization rates and charges: the Urban Diabetes Study. *Diabetes Care*. 2008; 31:655-660.

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## INTERMEDIATE OUTCOME, PROCESS, OR STRUCTURE PERFORMANCE MEASURE

**1a.3. Briefly state or diagram the path between structure, process, intermediate outcome, and health outcomes.** Include all the steps between the measure focus and the health outcome.

**1a.3.1. What is the source of the systematic review of the body of evidence that supports the performance measure?**

☒ Clinical Practice Guideline recommendation – **complete sections 1a.4, and 1a.7**

☐ US Preventive Services Task Force Recommendation – **complete sections 1a.5 and 1a.7**

☐ Other systematic review and grading of the body of evidence (e.g., *Cochrane Collaboration*, *AHRQ Evidence Practice Center*) – **complete sections 1a.6 and 1a.7**

☒ Other – **complete section 1a.8**

*Please complete the sections indicated above for the source of evidence. You may skip the sections that do not apply.*

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## 1a.4. CLINICAL PRACTICE GUIDELINE RECOMMENDATION

**1a.4.1. Guideline citation (including date) and URL for guideline (if available online):**

**Guidelines demonstrate that prevention of the condition (and, by definition, the hospitalization for the condition) is possible.**

American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care*. 2013; 36(Suppl 1):S11-66.  
NGC: 009808-009815 (URL: <http://www.guideline.gov/search/search.aspx?term=diabetes>) (more detail in 1a.4.2)

Other guidelines that similarly note that a focus on comprehensive care to optimally manage the patient and prevent morbidity for diabetes (and need for intensive in-hospital care) include:

NGC: 009095. Riethof M, Flavin PL, Lindvall B, Michels R, O'Connor P, Redmon P, Retzer K, Roberts J, Smith S, Sperl-Hillen J, Institute for Clinical Systems Improvement (ICSI). Diagnosis and management of type 2 diabetes mellitus in adults. Bloomington (MN): Institute for Clinical Systems Improvement (ICSI); 2012 Apr. 141 p. [198 references]

NGC: 009416. University of Michigan Health System. Management of type 2 diabetes mellitus. Ann Arbor (MI): University of Michigan Health System; 2012 Sep. 27 p. [17 references]

NGC: 008116. Department of Veteran Affairs, Department of Defense. VA/DoD clinical practice guideline for the management of diabetes mellitus. Washington (DC): Department of Veteran Affairs, Department of Defense; 2010 Aug. 146 p.

**1a.4.2. Identify guideline recommendation number and/or page number and quote verbatim, the specific guideline recommendation.**

Guidelines include major recommendations for screening and diagnosis, goals and treatment in the following areas: hypertension/blood pressure control, dyslipidemia/lipid management, glycemic control, smoking cessation,

coronary heart disease screening and treatment, nephropathy screening and treatment, retinopathy screening and treatment and neuropathy screening and treatment.

Specific guideline recommendations are available at the above reference, with grades of A, B and E.

The potential benefits of the guidelines is the prevention and management of diabetes complications. Three objectives are outlined for implementation of the guidelines, including optimizing provider and team behavior, supporting patient behavior change, and changing the system of care.

**1a.4.3. Grade assigned to the quoted recommendation with definition of the grade:**

Definitions: A=clear evidence of well-conducted, generalizable randomized controlled trials (RCTs) that are adequately powered, including well-done meta-analyses. The recommendations have the best chance of improving outcomes when applied to the population to which they are appropriate. B= supportive evidence from a well-conducted cohort or case-control study. C=supportive evidence from poorly controlled or uncontrolled studies or conflicting evidence with weight of evidence supporting the recommendation; E=expert consensus or clinical experience.

**1a.4.4. Provide all other grades and associated definitions for recommendations in the grading system.** (Note: If separate grades for the strength of the evidence, report them in section 1a.7.)  
**See 1a.4.3**

**1a.4.5. Citation and URL for methodology for grading recommendations** (if different from 1a.4.1):

**1a.4.6. If guideline is evidence-based (rather than expert opinion), are the details of the quantity, quality, and consistency of the body of evidence available (e.g., evidence tables)?**

☐ Yes → **complete section 1a.7** See URL

☐ No → **report on another systematic review of the evidence in sections 1a.6 and 1a.7; if another review does not exist, provide what is known from the guideline review of evidence in 1a.7**

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**1a.5. UNITED STATES PREVENTIVE SERVICES TASK FORCE RECOMMENDATION**

**1a.5.1. Recommendation citation** (including date) **and URL for recommendation** (if available online):

**1a.5.2. Identify recommendation number and/or page number and quote verbatim, the specific recommendation.**

**1a.5.3. Grade assigned to the quoted recommendation with definition of the grade:**

**1a.5.4. Provide all other grades and associated definitions for recommendations in the grading system.** (Note: the grading system for the evidence should be reported in section 1a.7.)

**1a.5.5. Citation and URL for methodology for grading recommendations** (if different from 1a.5.1):

**Complete section 1a.7**

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## **1a.6. OTHER SYSTEMATIC REVIEW OF THE BODY OF EVIDENCE**

**1a.6.1. Citation** (*including date*) and **URL** (*if available online*):

**1a.6.2. Citation and URL for methodology for evidence review and grading** (*if different from 1a.6.1*):

**Complete section [1a.7](#)**

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### **1a.7. FINDINGS FROM SYSTEMATIC REVIEW OF BODY OF THE EVIDENCE SUPPORTING THE MEASURE**

*If more than one systematic review of the evidence is identified above, you may choose to summarize the one (or more) for which the best information is available to provide a summary of the quantity, quality, and consistency of the body of evidence. Be sure to identify which review is the basis of the responses in this section and if more than one, provide a separate response for each review.*

**1a.7.1. What was the specific structure, treatment, intervention, service, or intermediate outcome addressed in the evidence review?**

**1a.7.2. Grade assigned for the quality of the quoted evidence** with definition of the grade:

**1a.7.3. Provide all other grades and associated definitions for strength of the evidence in the grading system.**

**1a.7.4. What is the time period covered by the body of evidence?** (*provide the date range, e.g., 1990-2010*). Date range: [Click here to enter date range](#)

### **QUANTITY AND QUALITY OF BODY OF EVIDENCE**

**1a.7.5. How many and what type of study designs are included in the body of evidence?** (*e.g., 3 randomized controlled trials and 1 observational study*)

**1a.7.6. What is the overall quality of evidence** across studies **in the body of evidence?** (*discuss the certainty or confidence in the estimates of effect particularly in relation to study factors such as design flaws, imprecision due to small numbers, indirectness of studies to the measure focus or target population*)

### **ESTIMATES OF BENEFIT AND CONSISTENCY ACROSS STUDIES IN BODY OF EVIDENCE**

**1a.7.7. What are the estimates of benefit—magnitude and direction of effect on outcome(s)** across studies in the body of evidence? (*e.g., ranges of percentages or odds ratios for improvement/decline across studies, results of meta-analysis, and statistical significance*)

**1a.7.8. What harms were studied and how do they affect the net benefit (benefits over harms)?**

### **UPDATE TO THE SYSTEMATIC REVIEW(S) OF THE BODY OF EVIDENCE**

**1a.7.9. If new studies have been conducted since the systematic review of the body of evidence, provide for each new study: 1) citation, 2) description, 3) results, 4) impact on conclusions of systematic review.**

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**1a.8 OTHER SOURCE OF EVIDENCE**

*If source of evidence is NOT from a clinical practice guideline, USPSTF, or systematic review, please describe the evidence on which you are basing the performance measure.*

**1a.8.1 What process was used to identify the evidence?**

Formal environmental scans of the literature, including routine Pub-Med searches.

**1a.8.2. Provide the citation and summary for each piece of evidence.**

**Evidence on Impact**

Diabetic ketoacidosis (DKA), hyperosmolarity (or hyperglycemic hyperosmolar nonketonic syndrome (HHNS)), and coma are acute, life-threatening complications of diabetes mellitus, particularly Type 1 or insulin-dependent diabetes mellitus (IDDM). Diabetic emergencies arise when there is an excess of either glucose or insulin in the patient's bloodstream. The balance of insulin and glucose is kept stable by proper administration of insulin, and may involve other activities such as home blood-glucose monitoring. It has been noted in an adolescent and young adult population that better adherence to treatment (actual insulin intake vs. prescribed intake) is associated with fewer admissions for DKA and other acute diabetes complications (1-3). Education programs for patients with diabetes have mixed results on reducing admissions for diabetic emergencies, though some have been shown to be effective (4). It is important to note that intensive treatment (a continuous insulin infusion pump or multiple, three or more, insulin injections daily) has been associated with two to three times more admissions for hypoglycemia (5,6). Research supports early, intensive treatment in Type 1 diabetic patients, with the primary goal of maintaining HbA1c levels as close to normal (i.e., less than six percent) in order to achieve long-term benefits and reduce the risk of complications (7). Such intensive treatment has not been shown to have an impact on admissions for hyperglycemic events, but does reduce the incidence of long-term diabetes complications(5). Both hypoglycemic and hyperglycemic events are included in this indicator.

Lack of diabetes control and the resulting hyperglycemia is intimately linked with short-term complications of diabetes and resulting hospital admissions. The differentiation between uncontrolled diabetes and short-term complications from diabetes may be more of a coding artifact than a true difference in disease severity or consequence. Therefore, measures of the short-term diabetes complications indicator should be combined with the uncontrolled diabetes indicator (PQI 14) in any analysis (6).

The size of the US population with diabetes is large and growing, suggesting that this indicator should be precisely measurable for most areas. In the US in 2010, an estimated 25.6 million people over the age of 20 had diagnosed or undiagnosed diabetes, which is over 11% of this population. In 2010, 1.9 million people over the age of 20 were newly diagnosed with diabetes in the US and 35% of the US population from 2005 – 2008 had pre-diabetes. Acute diabetic complications were the seventh leading cause of death in the US in 2007 (7). The combination of uncontrolled diabetes (PQI 14) and short-term diabetes complications accounted for 36% of all diabetes hospitalizations in one study (8).

## Clinical Evidence

Two studies examined participation in specialized diabetes care clinics and hospitalization. An ecological study performed in Piemonte, Italy, using secondary data, tested the effect of specialized diabetes care on hospitalization rates for diabetes. The authors found that the standardized hospitalization rate at the local health unit level was directly associated with the number of hours of specialty care ( $R^2 = 0.464$ ,  $p = 0.0019$ ). However, patients who received a high average number of hours of diabetes care ( $>0.9$  hours per week per 1,000 inhabitants) were significantly less likely to have an emergency/unplanned hospital admission (OR, 0.37; 95% CI, 0.20, 0.67) and spent fewer days in the hospital on average (-0.26 days; 95% CI, -0.45 - -0.06), independent of socioeconomic level (9). In another retrospective cohort study, Huang et al. investigated health care utilization among Type 2 diabetic patients treated in diabetes centers and general medicine clinics at Massachusetts General Hospital. Despite the diabetes center patients having much more severe diabetes, no significant differences were observed in cost or utilization outcomes between the two populations (e.g., OR for hospitalization, 0.88; 95% CI, 0.52-1.49) (10).

An ecological study performed in Ontario, Canada compared acute diabetes complication rates over time, adjusting for geographic factors. Utilizing linked administrative and census data, the primary outcomes of interest were hyper- or hypoglycemia-related hospital admissions and emergency department visits for diabetes. Between 1994 and 1999, Booth et al. demonstrated decreases of 33 percent and 75 percent for hyper- and hypoglycemia-related admissions, respectively, although these decreases could not be linked to any specific interventions (11). In a study in Victoria, Canada, there was a 12-fold variation in admission for diabetes complications rates for diabetes complications across Primary Care Partnership (PCPs), with 13 PCPs having significantly higher rates than the Victorian average (12). Another study in urban Canada discovered hospital admission rates were 2.7 times higher for certain ACSCs, specifically diabetes, in lower SES patients when compared to higher SES counterparts (13).

A few studies have failed to show an association between glucose control or interventions aimed at improving control, and hospitalization. By means of administrative data and in a historical cohort study in Seattle, diabetic patients whose HbA1c improved from 1992 through 1997 did not show a significant difference in hospitalization. However, improvement in HbA1c was associated significantly with cost savings within one to two years of improvement (14). Clinical evidence shows that improvements in HbA1c levels (i.e., less than seven percent) can reduce or delay complications related to both Type 1 and 2 diabetes and that even slight reductions in HbA1c levels have shown significant cost savings. A clinical trial suggested that continuous glucose monitoring (CGM) with intensive insulin therapy reduced overall HbA1c levels in addition to being cost-effective (15).

## References:

1. Fritsch M, Rosenbauer J, Schober E, Neu A, Placzek K, Holl RW. Predictors of diabetic ketoacidosis in children and adolescents with type 1 diabetes. Experience from a large multicentre database. *Pediatr Diabetes* 2011;12:307-312.
2. Morris AD, Boyle DI, McMahon AD, Greene SA, MacDonald TM, Newton RW. Adherence to insulin treatment, glycaemic control, and ketoacidosis in insulin-dependent diabetes mellitus. The DARTS/MEMO Collaboration. Diabetes Audit and Research in Tayside Scotland. Medicines Monitoring Unit. *Lancet* 1997;350:1505-1510.

3. Thompson CJ, Cummings F, Chalmers J, Newton RW. Abnormal insulin treatment behaviour: a major cause of ketoacidosis in the young adult. *Diabet Med* 1995;12:429-432.
4. Day JL, Metcalfe J, Johnson P. Benefits provided by an integrated education and clinical diabetes centre: a follow-up study. *Diabet Med* 1992;9:855-859.
5. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. The Diabetes Control and Complications Trial Research Group. *N Engl J Med* 1993;329:977-986.
6. Hypoglycemia in the Diabetes Control and Complications Trial. The Diabetes Control and Complications Trial Research Group. *Diabetes* 1997;46:271-286.
7. Genuth S. Insights from the diabetes control and complications trial/epidemiology of diabetes interventions and complications study on the use of intensive glycemic treatment to reduce the risk of complications of type 1 diabetes. *Endocr Pract* 2006;12 Suppl 1:34-41.
8. Ahern MM, Hendryx M. Avoidable hospitalizations for diabetes: comorbidity risks. *Dis Manag* 2007;10:347-355.
9. Giorda C, Petrelli A, Gnani R. The impact of second-level specialized care on hospitalization in persons with diabetes: a multilevel population-based study. *Diabet Med* 2006;23:377-383.
10. Huang ES, Gleason S, Gaudette R et al. Health care resource utilization associated with a diabetes center and a general medicine clinic. *J Gen Intern Med* 2004;19:28-35.
11. Booth GL, Hux JE, Fang J, Chan BT. Time trends and geographic disparities in acute complications of diabetes in Ontario, Canada. *Diabetes Care* 2005;28:1045-1050.
12. Ansari Z, Carson N, Serraglio A, Barbetti T, Cicuttini F. The Victorian Ambulatory Care Sensitive Conditions study: reducing demand on hospital services in Victoria. *Aust Health Rev* 2002;25:71-77.
13. Disano J, Goulet J, Muhajarine N, Neudorf C, Harvey J. Social-economic status and rates of hospital admission for chronic disease in urban Canada. *Can Nurse* 2010;106:24-29.
14. Wagner EH, Sandhu N, Newton KM, McCulloch DK, Ramsey SD, Grothaus LC. Effect of improved glycemic control on health care costs and utilization. *JAMA* 2001;285:182-189.
15. McQueen RB, Ellis SL, Campbell JD, Nair KV, Sullivan PW. Cost-effectiveness of continuous glucose monitoring and intensive insulin therapy for type 1 diabetes. *Cost Eff Resour Alloc* 2011;9:13.