

# CDS Starter Kit: Diabetes follow-up care

## Introduction

The delivery of high-quality diabetes care is a complex process that requires a provider to consider many pieces of patient information and treatment guidelines. Given that many recommendations for diabetes care are relatively well-defined, diabetes follow-up care is a good opportunity to use CDS and begin combining different types of CDS to support workflow transformation and improve patient care.

## Treatment guidelines and logic used by the CDS

In this Starter Kit, the focus is on three areas of diabetes care: 1) regular testing in patients with well-controlled diabetes; 2) treatment for patients with diabetes and hypertension; and 3) annual microfilament foot exams for patients with diabetes. The guidelines for each are provided below.

### 1) Regular testing in well-controlled diabetes patients

The American Diabetes Association has established guidelines for standard monitoring of diabetic patients.<sup>(1)</sup>

- Hemoglobin A1C (HbA1c) testing is recommended twice per year in well-controlled patients
- Tests of urine protein levels are recommended annually - Nephropathy in Diabetes
- Lipid panels should be tested annually

### 2) Treatment for hypertension in diabetes patients (2)

For patients with diabetes and hypertension, the target blood pressure (BP) is <130/80 mmHg. Drug therapy is recommended for patients with diabetes and hypertension when systolic blood pressures are >140 mmHg and/or diastolic >85-90 mmHg. Two-drug therapy is recommended when BP is more than 20/10 mmHg to 30/10 mmHg above goal, either as a separate prescription or in fixed dose combinations.

Preferred drugs for the treatment of diabetes and hypertension (in the absence of heart failure, known coronary heart disease, or microalbuminuria):

- The preferred first-line drug is either a thiazide type diuretic or an ACE inhibitor. Combination therapy of hydrochlorothiazide/ACE inhibitors as first-line therapy is an option.
- For two drugs: When a second drug is required for hypertension control, it should be either an ACE inhibitor or a diuretic.

- For three drugs: If blood pressure is not controlled on a thiazide-type diuretic in addition to an ACE inhibitor, then treatment with a thiazide-type diuretic, an ACE inhibitor AND a beta-blocker are recommended.

### 3) Foot exams

All individuals with diabetes should receive an annual foot examination to identify high-risk foot conditions, or as advised by a physician. (3)

## User guide for CDS tools for diabetes follow-up care

### Diagnosis & treatment

#### Step 1: Enter diabetes (with hypertension) follow-up care as reason for visit

The documentation of diabetes follow up care as the reason for visit is a trigger that activates diabetes specific CDS. Documentation of reason for visit is typically completed by a medical assistant or scheduling assistant. It is important that the individual completing the documentation is adequately trained in how to use the EHR and CDS system.

#### Step 2: Measure and record vitals, current medications, and other pertinent data related to diabetes-care

Current vital signs, medications, and information about compliance with treatment plans should be documented at the beginning of a visit for diabetes follow-up care. Because there is a relatively standard set of information that needs to be collected, a ~~CDS documentation template~~ can be used to ensure that information is documented consistently.

#### Step 3: Perform follow-up care

High-quality diabetes care requires providers to use information many types of information, including but not limited to, vitals and measurements, laboratory test results, medications. These data may have been documented at different points in time and may be stored document in different areas of the chart. A powerful advantage of EHRs with CDS is that they can pull together data from many parts of the chart and organize them in new and helpful ways. For example, the information can be pulled together in a single screen or CDS module that is specifically designed to support diabetes care. This type of CDS falls into the general category of ~~data display~~.

- Review standard laboratory tests, order tests if needed

For patients with well-controlled diabetes, HBA1C testing is recommended every 6 months; lipid panels and urine protein are tested annually. If a patient is overdue for any of these tests, the physician can be ~~alerted~~ that the test needs to be ordered. Many CDS systems provide a link to an order entry screen near the alert to support the provider's workflow. Systems may also provide ~~info~~ buttons if the provider wants to learn more about the guidelines and recommendations.

- Review blood pressure, prescribe drug therapy if indicated

Providers review current blood pressure to ensure that it is within the recommended range. If blood pressure is out of range, drug therapy is recommended. This process has multiple opportunities for CDS. For example, an ~~alert~~ can be used to signal that the patient's blood pressure is out of range. The system can support documentation of the issue by automating documentation or guiding the provider to a documentation screen after the provider clicks to acknowledge the alert. Once elevated blood pressure is documented as a problem, the system may provide a second alert regarding recommended drug therapy. Many CDS systems provide a link to an order entry screen near the alert to support the provider's workflow.

- Review date of most recent foot exam, perform foot exam if needed

An annual foot exam is recommended for all diabetic patients. If a patient is overdue for a foot exam, the CDS system may provide an ~~alert~~ that the test should be performed. Some CDS systems provide a link to a ~~documentation template~~ specifically designed for diabetes foot exams. ~~Infobuttons~~ can also provide support for those who wish to learn more about the evidence for foot exams.

## Example

### NextGen Ambulatory EHR (4)

Steps 1 & 2: Enter diabetes (with hypertension) follow-up care as reason for visit & measure and record vitals, current medications, and other pertinent data related to diabetes-care

The reason for visit and updated vital signs and other relevant data are entered into documentation templates.

#### Step 3: Perform follow-up care

Clinical decision support for diabetes follow-up care is provided through the Chronic Conditions HPI and Diabetes Flowsheet. Pictured below, the Diabetes Flowsheet is a standard part of the Ambulatory EHR system. It organizes data on vital signs, smoking status, immunizations, referrals, laboratory tests, drug therapy, and diabetes self-management. This flowsheet combines ~~data display, alerts and reminders, documentation templates, and infobuttons~~ to support comprehensive diabetes follow-up care.

Diabetes Flwsheet

Diabetes Mellitus Diagnosis **DM, uncomplicated, type II, uncontro** 258.02

**Vital Signs** BP Elevated: Click to go to HTH Flowsheet

Height  in  cm ☐ measured this encounter ☐ carried forward from last encounter

Last Measured 10/22/2007

Weight 169.0 lb 76.82 kg

BMI

BP Goal for DM 130 Syst 80 Diast

BP Sitting 132 Syst 84 Diast **Excluded**

Pulse 72

**Smoking** Smoker ☐ Yes ☒ Never ☐ Former

Counseling ☐ Yes ☐ No ☐ NA

Pharmacologic ☐ Yes ☐ No ☐ NA

**Depression Screening**

**Monofilament Instructions**

**IMMUNIZATIONS**

Influenza ☐ completed 12/09/2008 ☐ Order ☒ Completed ☐ Excluded

Pneumovax ☐ completed 09/03/2009 ☐ Order ☒ Completed ☐ Excluded

**REFERRALS**

Dental Exam  ☐ Order ☐ Completed ☐ Excluded

Diabetes Educator  ☐ Order ☐ Completed ☐ Excluded

Dilated Eye Exam  **due** ☐ Order ☐ Completed ☐ Excluded

Endocrinologist  ☐ Order ☐ Completed ☐ Excluded

Foot Examination  **due** ☐ Perform ☐ Completed ☐ Excluded

Funduscopy Photo  ☐ Order ☐ Completed ☐ Excluded

Podiatrist  ☐ Order ☐ Completed ☐ Excluded

**Patient referral**

Framingham Heart Disease risk score

**LAB TESTS** (Labs ordered here will not upload to lab module)

Glucose ☐ completed 10/22/2007 ☐ Order ☒ Completed ☐ Excluded

Hemoglobin A1c ☐ completed 10/22/2007 ☐ Order ☒ Completed ☐ Excluded

Lipid Panel ☐ completed ☐ Order ☒ Completed ☐ Excluded

Fasting ☒ Yes ☐ No

Total Cholesterol 185 07/26/2008

HDL 65 07/26/2008

LDL 88 07/26/2008

Triglycerides 99 07/26/2008

**Urine Protein**

Creatinine Clearance  **due** ☐ Order ☐ Completed ☐ Excluded

Microalb (quant)  **due** ☐ Order ☐ Completed ☐ Excluded

**DRUG THERAPY** (Medication needs to be added directly in the Medications module)

Aspirin Use  active

☐ Active ☐ Prescribe ☐ Excluded

☒ Aspirin 81 mg PO one daily

☐ Aspirin 325 mg PO one daily

**SELF-MANAGEMENT** **Patient Education Materials**

Does patient possess knowledge of diabetes and its management? ☐ Yes ☐ No ☐ N/A

Does patient have ability and willingness to enact treatment plan? ☐ Yes ☐ No ☐ N/A

Does patient have self-management skills to manage diabetes care? ☐ Yes ☐ No ☐ N/A

**Self-Management Goals**

**Comments**

OK Cancel

- Review standard laboratory tests, order tests if needed

In the Diabetes Flowsheet, lab tests commonly used in diabetes care are organized in the upper right-hand corner of the sheet. In this example, the patient is up to date on glucose, HbA1c, and lipids panels, but is overdue on urine protein tests. The provider is alerted to overdue tests in RED. The provider can link to an order entry form by clicking the radio button to the left of the word "order".

**LAB TESTS** (Labs ordered here will not upload to lab module)

Glucose	completed	10/22/2007	<input type="radio"/> Order <input checked="" type="radio"/> Completed <input type="radio"/> Excluded
Hemoglobin A1c	completed	10/22/2007	<input type="radio"/> Order <input checked="" type="radio"/> Completed <input type="radio"/> Excluded
Lipid Panel	completed		<input type="radio"/> Order <input checked="" type="radio"/> Completed <input type="radio"/> Excluded

Fasting ☒ Yes ☐ No

Total Cholesterol	185	07/26/2008
HDL	65	07/26/2008
LDL	88	07/26/2008
Triglycerides	99	07/26/2008

**Urine Protein**

Creatinine Clearance	due	<input type="radio"/> Order <input type="radio"/> Completed <input type="radio"/> Excluded
Microalb (quant)	due	<input type="radio"/> Order <input type="radio"/> Completed <input type="radio"/> Excluded

- Review blood pressure, prescribe drug therapy if indicated

Blood pressure is displayed in the Vital Signs section of the Diabetes Flowsheet. In this example, the patient's sitting blood pressure is above the goal for diabetes patients. The CDS system automatically compares the current blood pressure to the goal and generates an ~~alert plus hyperlink in BLUE~~ across the top of the section that states "BP Elevated: Click to go to HTN (hypertension) Flowsheet. If the provider wanted to see more information about the recommended blood pressure goal, s/he could click the infobutton in blue next to "BP Goal for DM".

**Vital Signs** **BP Elevated: Click to go to HTN Flowsheet**

Height		in		cm	<input type="radio"/> measured this encounter
Last Measured	10/22/2007 <input type="radio"/> carried forward from last encounter				
Weight	169.0	lb	76.82	kg	
BMI					
BP Goal for DM	130	Syst	80	Diast	
BP Sitting	132	Syst	84	Diast	Excluded
Pulse	72				

[Upload Vital Signs](#)

If the provider clicks on the hyperlink to the Hypertension Flowsheet, the system will open new flowsheet pre-populated with information about the patient's vitals and comorbidities. The CDS provides multiple alerts (in red) to guide the provider through a workflow. First, the provider is alerted that the patient's blood pressure is elevated and that BP class needs to be documented. If the provider clicks on the "BP class", the system will launch a documentation template that allows the provider to select the severity of the patient's hypertension. Once BP Class is documented, the system will generate treatment recommendations presented in red. The provider can use this recommendation to inform treatment. In this example, the patient is already on the recommended drug therapy so the provider orders a blood pressure recheck. The provider can exit the HTN Flowsheet and return to the Diabetes Flowsheet when treatment of hypertension is considered complete.

<b>Height</b> <input type="text" value="5"/> <input type="text" value="0"/> cm <input type="radio"/> measured this encounter Last Measured 10/22/2007 <input type="radio"/> carried forward from last encounter <b>Weight</b> 169.0 lb 76.82 kg <b>BMI</b> 0.0 <input type="button" value="Upload Vital Signs"/>		<b>ACE Inhibitor Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded LOTENSIN BENAZEPRIL HCL 10MG 1T PO	
<b>Comorbid diseases</b> <input checked="" type="checkbox"/> Diabetes mellitus <input type="checkbox"/> Coronary Artery Disease <input type="checkbox"/> Renal insufficiency with > 1 gm per day proteinuria <input type="checkbox"/> Heart Failure <input type="checkbox"/> Renal insufficiency <= 1 gm per day of proteinuria <input type="checkbox"/> Post-myocardial infarction <input type="checkbox"/> Chronic Kidney Disease <input type="checkbox"/> Recurrent Stroke Prevention		<b>ARB Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded DIOVAN VALSARTAN 10MG	
<b>Goal of Treatment</b> BP Below: 130 / 80 <b>Blood Pressure</b> Excluded sitting 132 / 84 Elevated supine / / standing / / Max BP (this encounter) 132 / 84 Max BP (all encounters) 132 / 99		<b>Beta-Blocker Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded	
<b>Initial evaluation only</b> left leg / / right leg / / <input type="checkbox"/> Saved (to repeat BP, uncheck box and save again)		<b>CCB Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded	
<b>BP Class</b> I Stage 1 Hypertension Excluded		<b>Diuretic Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded	
<b>Thiazide-type diuretics for most. May consider ACEI, ARB, BB, CCB, or combination</b>			
<b>Drug(s) for compelling indications. Other antihypertensives as needed.</b>			
<b>Smoker</b> <input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Former		<b>Aldosterone antagonist</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded	
<b>Non-pharma therapy</b> <input type="radio"/> Excluded <input type="checkbox"/> Weight reduction <input type="radio"/> None <input type="radio"/> Initiate <input type="radio"/> Modify <input type="radio"/> Continue <input type="checkbox"/> Alcohol reduction <input type="radio"/> none <input type="radio"/> Initiate <input type="radio"/> Modify <input type="radio"/> Continue <input type="checkbox"/> Low sodium diet <input type="radio"/> None <input type="radio"/> Initiate <input type="radio"/> Modify <input type="radio"/> Continue <input type="checkbox"/> Exercise <input type="radio"/> None <input type="radio"/> Initiate <input type="radio"/> Modify <input type="radio"/> Continue		<b>Depression Screening</b> <input type="text"/> Framingham Heart Disease risk score <input type="text"/>	
		<b>Self Management</b> <b>Patient Education Materials</b> Does patient possess knowledge of hypertension and its management ? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A Does patient have ability and willingness to enact treatment plan ? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A Does patient have the self-management skills to manage hypertension care ? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	
		<b>Self-management goals</b> <input type="text"/>	
		<b>Follow up</b> Recommended Interval 1 Month <input type="checkbox"/> OK <input type="checkbox"/> Order BP recheck <input type="text"/> <input type="button" value="OK"/> <input type="button" value="Cancel"/>	

<b>HTN Flowsheet</b>			
<b>Hypertension Management</b>			
<b>Height</b> <input type="text" value="5"/> <input type="text" value="0"/> cm <input type="radio"/> measured this encounter Last Measured 10/22/2007 <input type="radio"/> carried forward from last encounter <b>Weight</b> 169.0 lb 76.82 kg <b>BMI</b> 0.0 <input type="button" value="Upload Vital Signs"/>		<b>Medical therapy</b> (Note: Medications can be added by clicking on Active Text)	
<b>Comorbid diseases</b> <input checked="" type="checkbox"/> Diabetes mellitus <input type="checkbox"/> Coronary Artery Disease <input type="checkbox"/> Renal insufficiency with > 1 gm per day proteinuria <input type="checkbox"/> Heart Failure <input type="checkbox"/> Renal insufficiency <= 1 gm per day of proteinuria <input type="checkbox"/> Post-myocardial infarction <input type="checkbox"/> Chronic Kidney Disease <input type="checkbox"/> Recurrent Stroke Prevention		<b>ACE Inhibitor Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded LOTENSIN BENAZEPRIL HCL 10MG 1T PO	
<b>Goal of Treatment</b> BP Below: 130 / 80 <b>Blood Pressure</b> Excluded sitting 132 / 84 Elevated supine / / standing / / Max BP (this encounter) 132 / 84 Max BP (all encounters) 132 / 99		<b>ARB Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded DIOVAN VALSARTAN 10MG	
<b>Initial evaluation only</b> left leg / / right leg / / <input type="checkbox"/> Saved (to repeat BP, uncheck box and save again)		<b>Beta-Blocker Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded	
<b>BP Class</b> I Stage 1 Hypertension Excluded		<b>CCB Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded	
<b>Smoker</b> <input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Former		<b>Diuretic Therapy</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded	
<b>Non-pharma therapy</b> <input type="radio"/> Excluded <input type="checkbox"/> Weight reduction <input type="radio"/> None <input type="radio"/> Initiate <input type="radio"/> Modify <input type="radio"/> Continue <input type="checkbox"/> Alcohol reduction <input type="radio"/> none <input type="radio"/> Initiate <input type="radio"/> Modify <input type="radio"/> Continue <input type="checkbox"/> Low sodium diet <input type="radio"/> None <input type="radio"/> Initiate <input type="radio"/> Modify <input type="radio"/> Continue <input type="checkbox"/> Exercise <input type="radio"/> None <input type="radio"/> Initiate <input type="radio"/> Modify <input type="radio"/> Continue		<b>Aldosterone antagonist</b> <input type="radio"/> Active <input type="radio"/> Prescribe <input type="radio"/> Excluded	
		<b>Depression Screening</b> <input type="text"/> Framingham Heart Disease risk score <input type="text"/>	
		<b>Self Management</b> <b>Patient Education Materials</b> Does patient possess knowledge of hypertension and its management ? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A Does patient have ability and willingness to enact treatment plan ? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A Does patient have the self-management skills to manage hypertension care ? <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A	
		<b>Self-management goals</b> <input type="text"/>	
		<b>Follow up</b> Recommended Interval 1 Month <input type="checkbox"/> OK <input type="checkbox"/> Order BP recheck <input type="text"/> <input type="button" value="OK"/> <input type="button" value="Cancel"/>	

- Review date of most recent foot exam, perform foot exam if needed

Providers can review information about annual foot exams in the Referrals section of the Diabetes Flowsheet. An alert appears in red if the patient is overdue for a foot exam. If the provider clicks "Perform", a documentation template will launch to enable complete documentation of findings. The documentation also provides a hyperlink (in blue) to more information about how to conduct a foot

exam. When documentation of the foot exam is complete, the provider can exit out of the template and return to Diabetes Flowsheet.

REFERRALS		
Dental Exam	<input type="text"/>	<input type="radio"/> Order <input type="radio"/> Completed <input type="radio"/> Excluded
Diabetes Educator	<input type="text"/>	<input type="radio"/> Order <input type="radio"/> Completed <input type="radio"/> Excluded
Dilated Eye Exam	due	<input checked="" type="radio"/> Order <input type="radio"/> Completed <input type="radio"/> Excluded
Endocrinologist	<input type="text"/>	<input type="radio"/> Order <input type="radio"/> Completed <input type="radio"/> Excluded
Foot Examination	due	<input checked="" type="radio"/> Perform <input type="radio"/> Completed <input type="radio"/> Excluded
Fundoscopic Photo	<input type="text"/>	<input type="radio"/> Order <input type="radio"/> Completed <input type="radio"/> Excluded
Podiatrist	<input type="text"/>	<input type="radio"/> Order <input type="radio"/> Completed <input type="radio"/> Excluded
Patient referral		
Framingham Heart Disease risk score <input type="text"/>		

Pe Extremity

Constitutional | Head | Face | Eyes | Ears | Nose | Mouth | Throat  
Neck | Thyroid | Lymphatic | Breast | Respiratory | Thorax | Cardiovascular  
Vascular | Abdomen | Genitourinary | Rectal | Skin | Hair  
Back | Spine | Musculoskeletal | Extremities | Neurological | Psychiatric

Extremities select all normal ✓

Pulses Vascular Right Left Monofilament Exam  
Dorsalis Pedis ☒ Normal ☐ Normal ☐ Normal ☐ Abnormal  
Posterior Tibial ☒ Normal ☐ Normal ☐ Normal ☐ Abnormal

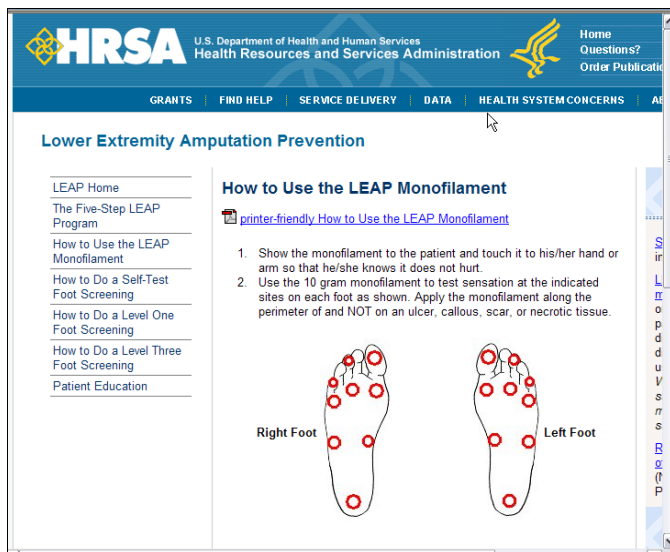
Edema ☒ No ☐ Yes Cyanosis ☒ No ☐ Yes

Ulceration ☒ No ☐ Yes Calf Tenderness ☒ No ☐ Yes

Amputation ☐ Clubbing ☒ Absent ☐ Present Varicosities ☒ No ☐ Yes  
Homans' Sign ☒ No ☐ Yes

Comments

OK CANCEL



When the provider considers diabetes follow-up care to be complete, s/he can exit out of the Diabetes Flowsheet and address any other problems that require attention during this visit.

## Summary

The NextGen and Cerner examples illustrate the versatility of CDS for diabetes. Apart from providing vendor-specific guidance, these examples can help implementers think about how different CDS intervention types can match work processes for a particular clinical condition.

## References

1. American Diabetes Association. Executive summary: Standards of medical care in diabetes--2011. *Diabetes Care*. 2011 Jan;34 Suppl 1:S4-10.
2. Kaiser Permanente Care Management Institute. Adult Diabetes Clinical Practice Guidelines [Internet]. Agency for Healthcare Research and Quality October 30, 2006 cited 06/08/11]. Available from: <http://guidelines.gov/content.aspx?id=9659&search=diabetes+and+diabetic+hypertension+and+130%2f80+mmhg+and+85-90>
3. Mayfield JA, Reiber GE, Sanders LJ, Janisse D, Pogach LM, American Diabetes Association. Preventive foot care in diabetes. *Diabetes Care*. 2004 Jan;27 Suppl 1:S63-4.
4. NextGen Healthcare Information Systems, Inc. Online demonstration [Internet]. Available from: <https://www.nextgen.com/Community/VirtualOffice/DemoLogin.aspx>