Impact of an Electronic Medical Record-Based Clinical Decision Support Tool for Dysphagia Screening on Care Quality

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Background and Purpose—Dysphagia screening (DS) before oral intake in patients with acute stroke is a hospital-level performance measure. We report outcomes of an initiative to improve compliance to this quality measure.

Methods—The design was a pre- versus postintervention comparison study. The intervention was an electronic medical record-based clinical DS system embedded within stroke admission orders. The clinical DS was designed to facilitate DS in patients with stroke. The primary outcome was compliance to a process measure in patients with ischemic stroke: performance of a swallow screen before oral intake.

Results—DS measure compliance increased from 36% to 74% ($P=0.001$). Chart audits found screened patients were more likely to have clinical DS-embedded admission orders initiated or stroke unit admission.

Conclusion—The electronic medical record offers a ready platform for clinical DS implementation. DS is a difficult performance measure to improve. The described clinical DS has the potential for improving performance on this challenging care quality measure.  

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Key Words: clinical decision support  ■  dysphagia screening  ■  EMR  ■  organized stroke care  ■  outcomes  ■  stroke care  ■  stroke units
Dysphagia Screening

Figure. Dysphagia screening flow chart accessible through a hyperlink in the order set. NPO indicates nothing by mouth; SLP, speech language pathologist.

DSPM compliance was assessed by examining the dysphagia screen time as documented in the EMR admission history or admission orders. Patient intake and medication records were examined for times of food, fluids, or medication intake and were compared with dysphagia screening times.

Additional Data
Place of care delivery (ie, stroke unit admission) and use of the EMR stroke orders (neither were mandatory stroke registry data elements) were collected on a random sample of patients to examine CDS use and reasons for DSPM noncompliance.

Intervention
An EMR-based CDS embedded in stroke admission orders had the following key components (the online-only Data Supplement has details): (1) dysphagia screening flowchart accessible through a hyperlink (Figure). Currently, no consensus designated standard dysphagia screen tool exists. Hence, the Figure flowchart is institution-specific and is not being promoted as standard of care. The online-only Data Supplement discusses the dysphagia screen design; (2) hard stop dysphagia screening order to be completed before admission orders could be signed; (3) default nothing by mouth diet, which had to be unselected to choose a different diet option; and (4) prompt for documentation of dysphagia screening time and results in the EMR admission note.

The intervention went online in November 2009; providers were trained through December 2009.

Analysis
Patient characteristics and intervention outcomes were compared preintervention (Year 2009) and postintervention (Years 2010–2011) using STATA IC 10 (StataCorp, College Station, TX). Chi-square test or Fisher exact test was used to determine statistical significance for categorical variables; Student t test was used for continuous variables.

Results
Between 2009 and 2011, the study hospital entered 1387 acute events into the stroke registry. After exclusions (361 transient ischemic attacks/stroke mimics; 94 intubated or nothing by mouth throughout hospitalization), 952 events were included. Online-only Data Supplement Table I compares patient characteristics pre- versus postintervention.

There were significant differences in pre- versus post intervention DSPM compliance (Table 1). Ischemic stroke compliance rose from 36% to 74% (P=0.001). Hemorrhagic stroke compliance rose from 4% to 28% (P=0.001).

Audit of a random sample of 50 charts from the postintervention period revealed that screened patients were more likely to have been admitted to the stroke unit and/or had the CDS-embedded order set initiated (Table 2).

There was no difference in secondary patient outcomes including mean length of hospital stay, in-hospital mortality, or pneumonia rates pre- versus postintervention.

Discussion
The following was learned. First, the EMR offers a ready platform for CDS. EMR-based CDS for improving stroke
rates may be explained by insufficient power to detect intervention effects and short hospital stays precluding detection of evolving pneumonia cases. In our prior work, unscreened patients had higher aspiration pneumonia rates than screened patients. Hincheij et al found institutions with formal dysphagia screening protocols had lower pneumonia rates. Hence, interventions improving screening rates such as EMR-based CDS will decrease pneumonia rates and improve outcomes.

We acknowledge our study is not a randomized controlled trial. There is ongoing debate about the role of randomized controlled trials in evaluation of QI interventions. Although randomized controlled trials are the gold standard for evaluating simple therapeutic interventions (eg, medication trials), the complexity of most QI interventions creates challenges for randomized controlled trial design and implementation. Randomized controlled trials testing QI intervention evaluation are ideally resource-intensive group randomized trials in which the units of randomization are hospitals rather than individual patients. In our study, because the CDS was a change in hospital ischemic stroke order sets, patients could not be randomized; hence, all patients with ischemic stroke received the intervention. Patients with hemorrhagic stroke formed a natural concurrent control group because the CDS was not yet implemented in order sets used in their care.

We concur with experts that QI intervention evaluation should use a wide range of methodologies. Our pre/post study design is commonly used in evaluating QI interventions; furthermore, we used a group of concurrent hemorrhagic stroke controls and undertook an additional evaluative step (Table 1) to understand the intervention’s effectiveness and if other factors (eg, stroke unit care) were facilitating measure compliance (Table 2).

Dysphagia screening is a difficult measure to improve care quality is still new. Despite multiple national stroke QI initiatives, reports of EMR-embedded CDS targeting stroke care are lacking. To our knowledge, the only similar report is an EMR-based ‘smart order set’ for venous thromboembolism prophylaxis.

CDS implementation was associated with improved DSPM compliance. Compliance was associated with order set use and stroke unit admission. Noncompliance was higher when both factors were absent (Table 2). Despite the CDS, measure compliance remained imperfect. One reason for imperfect compliance was frequent change of providers at the study hospital, requiring repeated orientation to order sets and CDS use.

Hemorrhagic strokes, typically admitted to surgical services without CDS admission order sets, showed poor DSPM compliance. Nevertheless, even in hemorrhagic strokes, measure compliance improved. A 2009 accreditation review at the study hospital identified DSPM compliance as an improvement area. Hence, hospital attention given to dysphagia screening in patients with stroke may explain improved care quality in hemorrhagic strokes.

Although our study showed a significant intervention effect in the primary, process outcome, there was no improvement in secondary clinical outcomes of pneumonia or in-hospital mortality. Lack of statistical significance in secondary outcomes are possibly explained by insufficient power to detect intervention effects and short hospital stays precluding detection of evolving pneumonia cases. In our prior work, unscreened patients had higher aspiration pneumonia rates than screened patients. Hincheij et al found institutions with formal dysphagia screening protocols had lower pneumonia rates. Hence, interventions improving screening rates such as EMR-based CDS will decrease pneumonia rates and improve outcomes.

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Dysphagia screening is a difficult measure to improve based not only on our experiences with the Minnesota Stroke Registry, but also reported at a national level. The CDS we describe has potential for improving this difficult measure.

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Disclosures
None.

References
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