

Evidence-Based Pneumonia Quality Improvement Programs and Strategies for Critical Access Hospitals

*Michelle M Casey, MS; Jill Klingner, RN, PhD; Shailendra Prasad, MBBS, MPH;
Walter Gregg, MA, MPH; Ira Moscovice, PhD
University of Minnesota Rural Health Research Center*

This brief is one in a series of policy briefs identifying and assessing evidence-based patient safety and quality improvement interventions appropriate for use by state Flex Programs and CAHs.

Introduction

This report focuses on evidence-based pneumonia Quality Improvement (QI) programs and strategies that are applicable to critical access hospitals (CAHs). The Flex Monitoring Team prepared this report as part of a larger project, whose purpose is 1) to identify successful evidence-based quality improvement (QI) programs and strategies related to acute myocardial infarction (AMI), pneumonia, heart failure and surgical care improvement that could be replicated in CAHs and 2) to disseminate information about these programs and strategies to State Flex Programs.

Background

QI programs can encompass a wide range of strategies, and many QI interventions include multiple strategies, which has made it difficult to evaluate their effectiveness. There is a growing awareness that QI strategies need to rest on a strong evidence base, and that greater attention needs to be paid to understanding why particular interventions work and the factors that affect their success in different settings.¹⁻³

Improving the quality of care provided by CAHs is an important goal of the Medicare Rural Hospital Flexibility (Flex) Program). Throughout the Flex Program, CAHs have implemented a range of QI activities with support from their State Flex Programs, as documented by previous Flex Monitoring Team CAH surveys and case studies.⁴⁻⁶ Support for QI in CAHs is a core activity area of focus in the current Flex Program Guidance, and the Flex Program is beginning a new special project, the Medicare Beneficiary Quality Improvement Project (MBQIP). MBQIP is focused on Medicare beneficiary health status improvement, which makes it especially important to identify successful QI programs that can be replicated in CAHs.

Key Findings

- Few articles in the peer-reviewed literature evaluate the effectiveness of quality improvement (QI) programs for pneumonia specifically for CAHs.
- The literature primarily addresses programs to improve hospitals' pneumonia care that were implemented by Quality Improvement Organizations in collaboration with State Flex Programs, State Hospital Associations, and other state and local partners.
- These QI programs primarily focus on improving:
 - 1) the timing and selection of appropriate antibiotics; and
 - 2) pneumococcal and influenza vaccination documentation and rates.
- Several QI strategies have been shown to improve pneumonia care and may be replicable in CAHs.

Pneumonia, heart failure and AMI are among the most common conditions treated in CAHs. Over the last five years, CAHs have improved their overall performance on publicly reported inpatient process of care quality measures for these three conditions, and for surgical care improvement measures. However, CAH performance continues to lag behind that of rural and urban Prospective Payment System hospitals, particularly on the AMI and heart failure measures. In addition, there is considerable variation in quality performance among CAHs, with some hospitals performing well, and others needing much more improvement.

Approach

We reviewed and synthesized several types of literature on QI programs and strategies, including articles in peer-reviewed healthcare journals and reports from a variety of public and private organizations working on QI issues in hospitals. The focus of this literature review and synthesis was on initiatives to improve care for pneumonia. We sought to identify programs and strategies that have been successfully implemented in small rural hospitals, as well as other programs and strategies that hold promise for adoption in the small rural hospital environment because the type of resources used to implement them are generally available to CAHs. A literature review on pneumonia prepared by the Oklahoma Foundation for Medical Quality was a valuable resource.⁷

To help identify additional QI programs and strategies that have not been documented in the literature, we consulted with members of the Flex Monitoring Team Expert Work Group, including State Flex Coordinators and CAH administrators, and reviewed information from State Flex Grant Applications compiled by the Technical Assistance Services Center (TASC). As needed, we also contacted sponsoring organizations to provide supplemental information on participant characteristics and QI methods and strategies used.

Results

Hospital QI programs to improve pneumonia care have primarily focused on 1) improving the timing and selection of appropriate antibiotics; and 2) improving documentation and rates of pneumococcal and influenza vaccinations.

The programs and strategies for improving pneumonia care that were identified in peer-reviewed literature, and through reports from QIOs or other state or national organizations are summarized by category below (the numbers after each program or strategy refer to the references that follow). See Table 1 for additional information about these programs/strategies, sponsoring organizations, program details and results, and the extent to which they included CAHs and other small rural hospitals.

QI Programs/Strategies focused on timing and selection of appropriate antibiotics for pneumonia patients

- Provision of baseline data on hospital performance (e.g., data on individual hospital-level performance on pneumonia antibiotic selection and timing quality measures provided prior to implementation of a QI intervention)^{8-14,18}
- Data feedback and benchmarking (e.g., data provided on hospital performance over time and in relation to other hospitals and/or desired levels of performance)^{8-14,18}
- Development of a QI plan (e.g., a plan for the hospital that defines the QI goals and activities to be implemented, the roles and responsibilities of hospital staff, performance indicators to be used, and evaluation metrics)^{8-11,18}
- Educational sessions with medical staff or subsets of medical staff (e.g., Emergency Department) and/or QI staff that address topics such as the scientific basis for specific performance measures, QI techniques)^{8-13,15,18-21}
- Provision of guidelines, tools and literature (e.g., recommendations regarding processes of care to be provided to patients; tools such as pocket cards listing appropriate antibiotics for pneumonia; and literature on results of quality studies)⁸⁻¹³

- Standardized/pre-printed admission order sheets (e.g., forms that list processes to be performed at admission such as oxygenation assessment and recommended antibiotics to be given for pneumonia)¹²⁻¹³
- Clinical pathways (e.g., a written protocol or guideline that describes the sequence of treatments to be provided)⁸
- Standing orders (e.g., a standardized form with orders for treatment that are preauthorized by a physician such as performance of blood/sputum cultures)^{8,9}
- Medical records checklists, forms and reminders^{9,14,20}
- Physician/nursing/pharmacy champions (an identified physician, nurse, or pharmacist who takes a leadership role and educates other staff regarding the importance of guideline implementation)^{9,13}
- Physician bonuses (e.g., monetary compensation provided to physicians for guideline use)¹³
- Combinations of 1) physician champion, standing orders, and medical records checklists, and 2) clinical pathways, standing orders, and patient management⁹
- and in relation to benchmarks or desired levels of performance)^{14,17,18,25}
- Educational sessions (e.g., on the importance of pneumococcal and influenza vaccinations and the effectiveness of strategies to improve documentation of vaccination status and increase vaccination rates) with medical staff, subsets of medical staff (e.g., Emergency Department) and/or nursing/QI staff)^{15,17-18,21-23}
- Standardized/pre-printed admission/intake assessment forms (e.g., forms that remind providers to check a patient's vaccination status at admission)^{14,16,20}
- Standing orders (e.g., a standardized form with orders for treatment that are preauthorized by a physician. Using standing orders, nurses can provide immunizations to patients who do not have contraindications, without direct physician involvement at the time.)^{15-16,29,30}
- Medical records checklists, forms and reminders (electronic or paper forms that recommend treatments such as pneumococcal or influenza vaccination or remind providers when vaccinations are due)^{15-16,20,23,25}

QI Programs/Strategies focused on improving documentation and rates of pneumococcal and influenza vaccination

- Provision of baseline data on hospital performance (e.g., data on individual hospital-level performance on vaccination quality measures prior to implementation of QI intervention)¹⁴
- Data feedback and benchmarking (e.g., data provided on hospital performance over time

Conclusions

While few articles in the peer-reviewed literature have evaluated the effectiveness of pneumonia QI programs specifically for CAHs, several QI programs and strategies have been shown to improve pneumonia care in hospitals and are potentially replicable in CAHs.

*This policy brief is available at <http://flexmonitoring.org>.
For more information, please contact Michelle Casey,
mcasey@umn.edu*

REFERENCES

1. Shojania K, McDonald K, Wachter R, Owens D. *Closing the Quality Gap: A Critical Analysis of Quality Improvement Strategies, Volume 1—Series Overview and Methodology*. Technical Review 9 (Contract No. 290-02-0017 to the Stanford University–UCSF Evidence-based Practices Center). AHRQ Publication No. 04-0051-1. Rockville, MD: Agency for Healthcare Research and Quality. August 2004.
2. Shojania K, Grimshaw, J. Evidence-Based Quality Improvement: The State of the Science. *Health Affairs* 24(1):138-150; 2005.
3. Auerbach A, Landefeld C, Shojania K. “The Tension Between Needing to Improve Care and Knowing How to Do It. *N Engl J Med* 357(6):608-613; 2007.
4. Casey M, Moscovice I. Quality Improvement Strategies and Best Practices in Critical Access Hospitals. *J Rural Health* 20(4):327-334, 2004.
5. Casey M. *Critical Access Hospital Quality Improvement Activities and Reporting on Quality Measures: Results of the 2007 National CAH Survey*. Flex Monitoring Team Briefing Paper No.18, March 2008. Available at: http://flexmonitoring.org/documents/BriefingPaper18_QualityReport2007.pdf
6. Coburn A, Richards M, Race M, Gale J. *Models for quality improvement in Critical Access Hospitals: The role of State Flex Programs*. Briefing Paper No.25. Portland, ME: Flex Monitoring Team, April 2010. Available at: <http://flexmonitoring.org/documents/BriefingPaper25-QI-Models-CAH-State-Flex-Program-Role.pdf>
7. Oklahoma Foundation for Medical Quality, Inc. *National Pneumonia Medicare Quality Improvement Project Literature Review July 2010 Update*. Available at: <http://www.qualitynet.org>
8. Chu L, Bratzler D, Lewis R et. al. Improving the Quality of Care for Patients with Pneumonia in Very Small Hospitals. *Arch Intern Med*, 163:326–332, 2003.
9. Weingarten J, Fan W, Peacher-Ryan H et. al. Hospital Quality Improvement Activities and the Effects of Interventions on Pneumonia: A Multistate Study of Medicare Beneficiaries. *Am J Med Quality* 2004; 19(4):157-165.
10. Yealy D, Auble T, Stone R, et. al. The Emergency Department Community-Acquired Pneumonia Trial: Methodology of A Quality Improvement Intervention. *Ann Emerg Med* 2004; 43(6):770-782.
11. Yealy D, Auble T, Stone R, et al., Effect of Increasing the Intensity of Implementing Pneumonia Guidelines: a Randomized Controlled Trial. *Ann Intern Med* 2005; 143(12):881-894.
12. Dean N, Silver M, Bateman K, et. al. Decreased Mortality after Implementation of a Treatment Guideline for Community-acquired Pneumonia. *Am J Med* 2001; 110:451– 457.
13. Dean N, Bateman K. Local Guidelines for Community-acquired Pneumonia: Development, Implementation, and Outcome Studies. *Infect Dis Clin North Am* 2004; 18:975-991.
14. Ellerbeck E, Totten B, Markello S et al. Quality Improvement in Critical Access Hospitals: Addressing Immunizations Prior to Discharge, *J Rural Health* 2003; 19(4):433–438.
15. Crouse B, Nichol K, Peterson D, et al. Hospital-Based Strategies for Improving Influenza Vaccination Rates. *J Fam Pract* 1994; 38:258- 261.
16. Honeycutt A, Coleman M, Anderson W et al. Cost Effectiveness of Hospital Vaccination Programs in North Carolina. *Vaccine* 2007; 25: 1484-1496.

17. Filardo et al. A Hospital-Randomized Controlled Trial of an Educational Quality Improvement Intervention in Rural and Small Community Hospitals in Texas Following Implementation of Information Technology. *Am J Med Qual* 2007; 22(6):418-427.
18. Filardo et al. A Hospital-Randomized Controlled Trial of an Educational Quality Improvement Intervention in Rural and Small Community Hospitals in Texas Following Implementation of Information Technology: One Year Results. *Int J Qual Health Care* 2009; 21(4):225-232.19. Haydar Z, Gunderson J, Ballard D, et al. Accelerating Best Care in Pennsylvania: Adapting a Large Academic System's Quality Improvement Process to Rural Community Hospitals. *Am J Med Qual* 2008; 23:252-258.
20. Andrews A, Valente A. Accelerating Best Care in Pennsylvania: the Hazelton General Hospital Experience. *Am J Med Qual* 2008; 23:259-265.
21. Dickey S, McNamara D. Meadville Medical Center's Experience with the Accelerating Best Care in Pennsylvania Project: Lessons Learned and Future Directions. *Am J Med Qual* 2008; 23:266-270.
22. Minnesota Flex Program. *A Look at Quality Improvement Activities, Outcomes and Needs*. August 2007. <http://www.health.state.mn.us/divs/orhpc/pubs/cahqi.pdf>
23. Pagan-Sutton, J et al. *Achieving Success in QIO and Rural Hospital Partnerships: Final Report*. February 2009. NORC Walsh Center for Rural Health Analysis.
24. The American Health Quality Association. Success Stories: Montana. http://www.ahqa.org/pub/quality/161_1101_5371.cfm. For additional information: Mountain Pacific Quality Health <http://www.mpqhf.org/>
25. The American Health Quality Association. Success Stories: Wyoming. http://www.ahqa.org/pub/quality/161_1101_5397.cfm For additional information: Mountain Pacific Quality Health <http://www.mpqhf.org/>
26. The American Health Quality Association. Success Stories: Idaho. http://www.ahqa.org/pub/quality/161_1101_5357.cfm For additional information: Qualis Health <http://www.qualishealth.org/>
27. The American Health Quality Association. Success Stories: Maine. http://www.ahqa.org/pub/quality/161_1101_5364.cfm
- The American Health Quality Association. Success Stories: Vermont. http://www.ahqa.org/pub/quality/161_1101_5391.cfm
- The American Health Quality Association. Success Stories: New Hampshire. http://www.ahqa.org/pub/quality/161_1101_5374.cfm
- For additional information: Northeast Health Care Quality Foundation. <http://www.nhcqf.org/>
28. Vermont Program for Quality in Health Care Incorporated. The Vermont Health Care Quality Report, 2003. <http://www.vpqhc.org/uploads/1252937982.pdf>
29. Briss P, Rodewald L, Hinman R et al. Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. *Am J Prev Med* 18(1S):97-140, 2000. doi:10.1016/S0749-3797(99)00118-X
30. Centers for Disease Control and Prevention. Notice to readers: Facilitating influenza and pneumococcal vaccination through standing orders programs. *Morb Mortal Wkly Rep* 2003; 52(04):68-69. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5204a4.htm>

TOOLS AND RESOURCES

Improving Treatment Decisions for Patients With Community-Acquired Pneumonia

This report describes two tools that help assess the need for hospitalization of patients with community-acquired pneumonia and determine the medical stability of patients prior to discharge.

<http://www.innovations.ahrq.gov/content.aspx?id=895>

Alerts, Standing Orders, and Care Pathways Boost Quality of Care for Pneumonia, Heart Attack, and Heart Failure

This site describes the standing orders implemented by Reid Hospital in Richmond, Indiana to improve care for patients with pneumonia.

<http://www.innovations.ahrq.gov/content.aspx?id=1750>

Standardized Tools and Protocols Increase Provision of Recommended Care in Key Clinical Areas, Reducing Hospital Mortality

This site describes the standardized care delivery processes used to improve care for patients with pneumonia by the Charleston Area Medical Center in Charleston, WV.

<http://www.innovations.ahrq.gov/content.aspx?id=2427>

Community Acquired Pneumonia - Admission Orders

This site describes admissions orders used by the Presbyterian System in western North Carolina to standardize initial care for pneumonia patients using antibiotic guidelines. http://www.hospitalmedicine.org/AM/Template.cfm?Section=QI_Clinical_Tools&Template=/CM/HTMLDisplay.cfm&ContentID=10540

American Health Quality Association. State Quality Improvement Efforts

This site describes State Quality Improvement Efforts implemented by Quality Improvement Organizations (QIOs) to help providers across the country adopt best practices.

http://www.ahqa.org/pub/quality/161_1101_5339.cfm?CFID=107198988&CFTOKEN=91338421

Antibiotic Recommendations for the Initial Treatment of Pneumonia

This pocket card from the Missouri QIO provides recommended antibiotics for ICU and Non-ICU patients with pneumonia.

http://www.primaris.org/sites/default/files/resources/Pneumonia/pn_antibiotic%20recommendations.pdf

Pneumococcal Polysaccharide Vaccine Pocket Card

This pocket card from the Missouri QIO provides indications, recommendations, algorithm and reactions for the pneumococcal vaccine.

<http://www.primaris.org/sites/default/files/resources/Pneumonia/card.pdf>

Table 1. Evidence-Based Pneumonia QI Programs/Strategies

Measures Addressed/Strategies Used	Sponsoring Organizations	Program Description	Results	Inclusion of CAHs/small rural hospitals	Citations
<p><u>Measures addressed:</u> Timing and selection of appropriate antibiotics</p> <p><u>Strategies used:</u></p> <ul style="list-style-type: none"> • Provision of baseline data on hospital performance • Data feedback and benchmarking • Development of a QI plan • Educational sessions with medical staff • Provision of guidelines, tools and literature • Clinical pathways (for antibiotic administration) • Standing orders (for performance of blood/sputum cultures) 	<p>CMS Health Care Quality Improvement Program and the Oklahoma Foundation for Medical Quality (QIO)</p>	<ul style="list-style-type: none"> • Study design: cohort control • 36 participating Oklahoma hospitals were divided into intervention and control groups • The intervention was performed by the QIO and consisted of external feedback through a face-to-face meeting with the medical staff • A personalized feedback packet of information was compiled for each hospital which included tables characterizing the hospital's performance on quality indicators, a review of the literature and a sample quality improvement plan • Additional assistance in the form of QI training techniques, additional site visits or teleconferences was provided as requested by the hospitals. 	<ul style="list-style-type: none"> • Statistically significant improvements occurred in the performance of all quality indicators measured after the intervention, including: <ul style="list-style-type: none"> ▪ the percent of patients who received antibiotics in emergency department (5.9 to 16.8%; p<.001) ▪ the percent of patients who received antibiotics within four hours of arrival (37.2 to 69.1%; p<.001) ▪ the percent of patients who had sputum cultures ordered (69.9 to 70.3%; p<.01) and blood cultures obtained within four hours of arrival (33.7 to 63.4%; p<.001). • Patient outcomes (e.g. unadjusted mortality and length of stay) also improved, although differences between the intervention and control hospitals were not statistically significant • Institution of clinical pathways was associated with an improvement in the timing of antibiotic administration (odds ratio OR = 1.83) 	<p>The hospitals in this study were described as primarily rural community hospitals. No information was given about CAH status.</p> <p>The median daily census was 10 in the intervention group and 8 in the control group.</p> <p>Hospitals were chosen to represent different geographic areas of the state and if they were not currently involved in a QIO directed QI project.</p>	<p>Chu et. al., 2003.⁸</p>

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			<ul style="list-style-type: none"> • Institution of standing orders was associated with an improvement in the performance of cultures (OR = 2.66) 		
<u>Measures addressed:</u> Timing of antibiotics <u>Strategies used:</u> <ul style="list-style-type: none"> • data feedback/ benchmarking • physician champion • administrative leadership support • computerized reminder systems • clinical pathways • standing orders • medical record checklists, forms, and reminders • patient management program 	CMS Health Care Quality Improvement Program and 13 QIOs	<ul style="list-style-type: none"> • Each QIO provided patient level hospital specific data for the quality indicator of interest (receipt of antibiotic within 8 hours) and information on the types of QI interventions implemented by each hospital. • Eight types of interventions were examined in various combinations. 	<ul style="list-style-type: none"> • Two individual interventions had significant positive impacts on the timely receipt of antibiotics: feedback and benchmarking (p<.01) and medical records checklists (p<.001). • Intervention combinations with significant positive impacts (p<.01) on the timely receipt of antibiotics included: 1) physician champion and patient management (OR = 3.03); 2) administrative support and patient management (OR = 1.79); 3) physician champion, standing orders and medical records checklist (OR = 2.94). 	A total of 215 hospitals participated including larger and smaller, urban and rural hospitals, but no breakdown was given on the number of hospitals in each category.	Weingarten et. al., 2004. ⁹
<u>Measures addressed:</u> blood cultures, oxygenation assessment, antibiotic timing and selection <u>Strategies used:</u>	Department of Emergency Medicine, University of Pittsburgh, funded by	<ul style="list-style-type: none"> • The study compared safety and effectiveness of three pneumonia guideline implementation strategies: high, moderate and low intensity interventions in 32 Emergency Departments in two 	<ul style="list-style-type: none"> • More low risk patients were appropriately treated as outpatients in the moderate intensity and high-intensity sites. 	A total of 29 urban and 3 rural hospitals participated, including 16 each in PA and CT. The hospitals had annual	Yealy et. al., 2004. ¹⁰ Yealy et. al., 2005. ¹¹

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<ul style="list-style-type: none"> • Provision of baseline data on hospital performance • Data feedback and benchmarking • Development of a QI plan • Educational sessions with medical staff and QI staff • Provision of guidelines, tools and literature 	<p>AHRQ. Interventions were conducted in collaboration with the QIOs in Pennsylvania and Connecticut.</p>	<p>states.</p> <ul style="list-style-type: none"> • The guideline consisted of recommendations for the initial site of treatment (the Pneumonia Severity Index or PSI) and processes of care after ED presentation including blood cultures, oxygenation assessment, antibiotic timing and selection. • For the low intensity strategy, the QIOs distributed hospital specific performance data to all ED and QI directors, requested the directors to develop a QI plan, and distributed the practice guideline to all ED medical providers. • The moderate strategy also included an on-site educational session to teach medical providers how to use the PSI and to reinforce guideline recommendations. • The high-intensity strategy included the low and moderate strategies as well as real-time reminders, medical provider audits and feedback, and 	<ul style="list-style-type: none"> • Adherence to recommended processes of care was better with the high-intensity intervention (44% of patients in the high-intensity sites had all four recommended processes of care performed, compared to 30% of the patients in moderate-intensity sites and 23% in the low intensity sites.) 	<p>ED volume of 15,000 or more patient visits. No information on hospital bed size.</p>	

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		continuous QI activities throughout the study.			
<u>Measures addressed:</u> Antibiotic timing and selection <u>Strategies used:</u> <ul style="list-style-type: none"> • Provision of baseline data on hospital performance • Data feedback and benchmarking • Educational sessions with medical staff and/or 10nursing/QI staff • Standardized/pre-printed admission/intake assessment forms • Physician champions? 	Intermountain Health Care, University of Utah, and Health Insight (QIO)	<ul style="list-style-type: none"> • The guideline was developed by combining local practices with American Thoracic Society guidelines. • Guideline implementation included formal presentations, academic detailing, preprinted outpatient and admission order sheets, letter reminders by pharmaceutical representatives, and reporting of outcome data to providers. 	<ul style="list-style-type: none"> • A reduced rate of 30 day mortality occurred among inpatients with pneumonia after guideline implementation (OR = 0.81). • Explanations for the decreased mortality included selection of more appropriate antibiotics, timing of initial antibiotic administration and use of heparin prophylaxis against thromboembolic disease. 	It was implemented in the Intermountain Health Care System which includes 23 hospitals. The smallest hospital in the system has 14 beds. Rural patients accounted for 42-47% of affiliated physicians' and 26-29% of nonaffiliated physicians' patients.	Dean et. al., 2001. ¹² Dean et. al., 2004. ¹³
<u>Measures addressed:</u> pneumococcal and influenza vaccination <u>Strategies used:</u> <ul style="list-style-type: none"> • Provision of baseline data on hospital performance • Data feedback and benchmarking • Educational sessions with medical staff and/or nursing/QI staff 	Kansas Foundation for Medical Care (QIO) and the Kansas Rural Health Options Project (Kansas Department of Health, Kansas Hospital Association, Kansas Board of	<ul style="list-style-type: none"> • 17 CAHs in Kansas received standardized information on the importance of hospital immunization programs and examples of standing orders and standardize nursing admission or intake assessment forms, and monthly peer comparison feedback on their performance in assessing and administering immunizations. • Decisions on interventions to 	<ul style="list-style-type: none"> • At baseline, 17% of patients had influenza immunization status documented and 2% received an influenza vaccination prior to discharge; at follow-up these rates had improved to 62% (p<.001) and 3.4% (p<.01). • Documentation of pneumococcal immunization status improved from 36% to 51% (p< .001), but the 	All 17 hospitals in the study were CAHs.	Ellerbeck et. al., 2003. ¹⁴

Measures Addressed/Strategies Used	Sponsoring Organizations	Program Description	Results	Inclusion of CAHs/small rural hospitals	Citations
<ul style="list-style-type: none"> Standardized/pre-printed admission/intake assessment forms Medical records checklists, forms and reminders 	Emergency Medical Services and the Kansas Medical Society.)	improve immunization were left to each individual hospital. Eight hospitals developed new charting procedures. None of the hospitals were able to obtain support from their medical staff to implement standing orders.	<p>number of patients actually receiving the vaccine did not change (1.3% at baseline and follow-up).</p> <ul style="list-style-type: none"> The eight hospitals that modified their intake assessment forms showed much higher rates of documentation of immunization status (77% vs. 30%; p <.01); however, these were not associated with improvements in actual immunization rates. Nurses could document status, but only physicians could order vaccine administration. 		
<p><u>Measures addressed:</u> influenza vaccination</p> <p><u>Strategies used:</u></p> <ul style="list-style-type: none"> Educational sessions with medical staff and/or nursing/QI staff Standing orders for immunizations by nurses Medical records checklists, forms and reminders 	Minnesota Coalition for Adult Immunization (One of eight pilot project groups established by the National Coalition for Adult Immunization's	<ul style="list-style-type: none"> Six community hospitals in northern Minnesota were visited and given a manual explaining the importance of targeting hospital-based patients for influenza immunization. The manual included pertinent medical literature such as the CDC Information Statement on Influenza. The recommended program called for development and 	<ul style="list-style-type: none"> Programs that implemented standing orders carried out by nursing staff were more effective than educational programs or physician reminders in offering and administering influenza vaccine. However, eliminating the physician from the process resulted in a greater refusal rate by patients. 	<ul style="list-style-type: none"> The two hospitals in the standing order group had an average of 28 beds. The two hospitals in the physician reminder group had an average of 106 beds. 	Crouse et. al., 1994. ¹⁵

Measures Addressed/Strategies Used	Sponsoring Organizations	Program Description	Results	Inclusion of CAHs/small rural hospitals	Citations
	Influenza and Pneumonia Action Group).	<p>implementation of standing orders, requiring nursing staff to review each patient for indications of vaccination and if indicated administer the vaccine before discharge.</p> <ul style="list-style-type: none"> In two hospitals, standing orders were approved by hospital staff. Two hospitals used physician reminders in patient charts as their strategy. The remaining two hospitals provided materials to physicians about vaccination. 	<ul style="list-style-type: none"> In hospitals with standing orders, 95% of patients were offered vaccine and 40% were vaccinated. In hospitals using physician chart reminders, 22% were offered and 17% vaccinated. In hospitals using physician education, 11.7% were offered and 9.6% vaccinated. Differences between the standing order and physician reminder groups were significant (p = .002). 	<ul style="list-style-type: none"> The two hospitals in the physician education group had an average of 275 beds. 	
<p><u>Measures addressed:</u> pneumococcal and influenza vaccination</p> <p><u>Strategies used:</u></p> <ul style="list-style-type: none"> Educational sessions with medical staff and/or nursing/QI staff Standing orders for immunizations by nurses Medical records checklists, forms and reminders 	North Carolina Hospital Association (Supported by CDC and the Association of Teachers of Preventive Medicine).	<ul style="list-style-type: none"> Eight rural hospitals and one urban hospital volunteered to participate in the study of the cost effectiveness of three different types of immunization programs: standing orders, preprinted order and physician reminder. All hospitals used a single screening form for both the influenza and the pneumococcal vaccines. 	<ul style="list-style-type: none"> Standing order programs had the lowest operational costs and the highest net effectiveness in terms of immunization rates. The total costs by hospital per patient vaccinated including screening, determining eligibility, ordering vaccine, administering it, and recordkeeping, were \$22-\$65 for standing orders; \$77-\$362 for preprinted orders; and \$144-\$179 for physician reminders. 	<ul style="list-style-type: none"> Eight of the nine hospitals in the study were rural. Two hospitals had less than 100 beds; the rest were larger. 	Honeycutt et al., 2007. ¹⁶

Measures Addressed/Strategies Used	Sponsoring Organizations	Program Description	Results	Inclusion of CAHs/small rural hospitals	Citations
<p><u>Measures addressed:</u> Oxygenation assessment, pneumococcal vaccination, and antibiotic timing</p> <p><u>Strategies used:</u></p> <ul style="list-style-type: none"> • Data feedback and benchmarking • Educational sessions with medical staff and/or nursing/QI staff 	<p>Institute for Health Care Research and Improvement at Baylor Health Care System. (Funded by AHRQ).</p>	<ul style="list-style-type: none"> • A hospital randomized controlled trial that evaluates the effectiveness of a rapid-cycle clinical care process educational program on tools and techniques for implementing and evaluating QI initiatives. • The primary outcomes are performance on community acquired pneumonia quality measures. • Two groups of hospitals were randomized to education (n=23) and control (n=22) groups • In Phase I all hospitals received a Web-based benchmarking tool only. In Phase II the education group also received a rapid-cycle educational intervention covering the basic techniques of designing, implementing, and monitoring a QI initiative. 	<ul style="list-style-type: none"> • Individual and composite CMS core measures for pneumonia were compared. There were no significant differences between the education and control groups on any measures. Baseline and follow-up scores were: oxygenation assessment (96.6 to 99% for education; 98.5 to 99.4% for control); vaccination (66.4 to 76.2% for education and 78.1 to 83.4% for control); antibiotic timing (78.3 to 82.1% for education and 81 to 82.9% for control). • However, only 16 of the 23 hospitals in the intervention group completed the didactic program and only six completed the full training program. The intervention also did not include other strategies in the Baylor program (e.g., training and funding of physician champions and engaging hospital boards directly). 	<ul style="list-style-type: none"> • 47 rural and mall community Texas hospitals • Hospitals had to be located in a county in Texas with population of <10,000 or designated as a CAH as of 2004. 	<p>Filardo et. al., 2007.¹⁷</p> <p>Filardo et. al., 2009.¹⁸</p>

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			Only 3 hospitals had physician participation in the education, despite it being required.		
<p><u>Measures addressed:</u> antibiotic timing and selection, pneumococcal vaccination</p> <p><u>Strategies used:</u></p> <ul style="list-style-type: none"> • Educational sessions with ED staff • Assignment of priority read status to X-rays for patients with suspected pneumonia • Data feedback to physicians not meeting the standards • Addition of 3 antibiotic choices to physician pneumonia order set and “1st nurse” guidelines • Standardized/pre-printed admission/intake assessment forms • Medical records 	Baylor Health Care System, Texas; Jefferson Medical College, Pennsylvania	<ul style="list-style-type: none"> • The “Accelerating Best Care” QI education program developed by Baylor was implemented in two rural Pennsylvania hospitals in collaboration with Jefferson Medical College. • The 6 month training included methods for rapid-cycle improvement; data system design and management; tools to improve patient processes and outcomes of care; use of clinical guidelines and protocols. • Multiple QI projects were implemented in each hospital; pneumonia projects included antibiotic timing and pneumococcal vaccine administration. 	<ul style="list-style-type: none"> • Hazelton Hospital increased its pneumococcal vaccination rate for eligible patients from 70% to 100%; 100% of patients with suspected pneumonia diagnosis received timely antibiotics. • Meadville Hospital increased its pneumococcal vaccination rate for eligible patients from 25% to 100%. 	<ul style="list-style-type: none"> • The two hospitals were rural but much larger than CAHs (150 and 249 beds). 	<p>Haydar et al, 2008.¹⁹</p> <p>Andrews & Valente, 2008.²⁰</p> <p>Dickey & McNamara, 2008.²¹</p>

Table 1. Evidence-Based Pneumonia QI Programs/Strategies					
Measures Addressed/Strategies Used	Sponsoring Organizations	Program Description	Results	Inclusion of CAHs/small rural hospitals	Citations
checklists, forms and reminders					
<u>Measures addressed:</u> pneumococcal and influenza vaccinations smoking cessation <u>Strategies used:</u> <ul style="list-style-type: none"> • Provision of baseline data on hospital performance • Data feedback • Educational sessions with medical staff and/or nursing/QI staff 	Stratis Health (QIO) and Minnesota Flex Program	<ul style="list-style-type: none"> • The 2002 CAH Collaborative used a modified version of the IHI Breakthrough Series Model, including 4 workshops, and continuous support and contact between each workshop. Topics addressed included pneumococcal and influenza vaccinations, and smoking cessation. 	Pneumococcal and influenza vaccination rates, and smoking cessation rates improved in the CAHs.	22 CAHs in Minnesota participated.	Minnesota Flex Program, 2007. ²²
<u>Measures addressed:</u> pneumococcal vaccinations <u>Strategies used:</u> <ul style="list-style-type: none"> • Provision of baseline data on hospital performance • Data feedback • Educational sessions with medical staff and/or nursing/QI staff • Medical records checklists, forms and reminders 	Primaris (QIO for Missouri)	<ul style="list-style-type: none"> • Baseline data on pneumococcal vaccination rates was distributed to CAHs and other rural hospitals in the state. • QI tools and information on data reporting and best practices in pneumonia prevention were shared. • Educational forums included in-person meetings, conference calls, and an active listserv. • Tools and resources were shared through a parallel initiative from the Missouri Hospital 	Several strategies were implemented at one CAH including a preadmission nursing assessment with questions on whether the patient had received influenza and pneumonia vaccinations. The report does not describe outcomes.	The project focused on CAHs and other rural hospitals in Missouri.	Pagan-Sutton et. al., 2009. ²³

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		Association.			
<u>Measures addressed:</u> pneumococcal vaccinations <u>Strategies used:</u> <ul style="list-style-type: none"> • Provision of baseline data on hospital performance • Data feedback • Educational sessions with medical staff and/or nursing/QI staff 	Mountain-Pacific Quality Health Foundation (QIO for Montana) in collaboration with the Montana Health Research and Education Foundation.	<ul style="list-style-type: none"> • The project was designed to decrease disparities in pneumococcal immunization in rural CAHs in the state. All Montana CAHs were targeted. • Numerous interventions included one-on-one training with CAHs; online training sessions with national and local experts; presentations at CAH conferences; development of tools and educational materials; provision of literature; and assistance with data collection. 	<ul style="list-style-type: none"> • At baseline, the five urban hospitals' pneumococcal immunization rate was 14.2% and the 34 CAHs rate was 6.9% for a disparity of 7.3%. • At re-measurement, the urban hospital rate was 37.5% and the CAHs rate was 35.4%, for a disparity of 2.1%. 	Project involved all Montana CAHs	The American Health Quality Association. Success Stories: Montana. ²⁴
<u>Measures addressed:</u> Blood cultures Antibiotic timing <u>Strategies used:</u> <ul style="list-style-type: none"> • Provision of baseline data on hospital performance • Data feedback • Educational sessions with medical staff 	Mountain-Pacific Quality Health Foundation (QIO for Wyoming)	<ul style="list-style-type: none"> • Mountain-Pacific Quality Health Foundation developed a project to decrease the disparity for in blood collection prior to giving antibiotics to patients with pneumonia in 9 CAHs in Wyoming. • In addition to recruiting 100% of the CAHs for public reporting on this clinical measure, MPQHF developed and implemented interventions such as presentations/WebEx; on-site visits by MPQHF medical 	<ul style="list-style-type: none"> • The baseline rate for the 9 CAHs was 75.9% compared to a baseline rate of 89.0% for rural, non-CAH and two urban hospitals. • At re-measurement, the rural non-CAH and urban hospitals rate dropped to 85.7%; the targeted nine CAHs increased to 88.5%. • The CAHs outperformed the rest of the hospitals in the state of Wyoming. 	Project involved 9 CAHs in Wyoming.	The American Health Quality Association. Success Stories: Wyoming. ²⁵

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		<p>directors targeting local physicians; literature; sample orders and data.</p> <ul style="list-style-type: none"> • MPQHF also assisted the hospitals with data collecting and reporting. 			
<p><u>Measures addressed:</u> Timing and selection of antibiotics Smoking cessation</p> <p><u>Strategies used:</u></p> <ul style="list-style-type: none"> • Provision of baseline data on hospital performance • Data feedback • Educational sessions with medical staff • Provision of guidelines • Standardized order sets 	Qualis Health (Idaho QIO)	<ul style="list-style-type: none"> • Qualis Health, the QIO for Idaho, worked with 14 rural hospitals in the state to improve care for patients with pneumonia. • Previous experience and variation with pneumonia care were examined, informal leaders were identified, and barriers were targeted. • Care standards were determined, guidelines established and staff and physician education was improved. • A multi-disciplinary team with upper management support researched other hospitals' standardized order sets and took the best methods and tools to customize for use in their own facility. • Qualis Health provided support via tools, educational 	<ul style="list-style-type: none"> • Pneumonia patients receiving timely antibiotics increased from 78% to 91% • Appropriate selection of antibiotics increased from 90% to 100% • Smoking cessation counseling rose from 9% to 100% among pneumonia patients. 	14 rural hospitals.	The American Health Quality Association. Success Stories: Idaho. ²⁶

Measures Addressed/Strategies Used	Sponsoring Organizations	Program Description	Results	Inclusion of CAHs/small rural hospitals	Citations
		<p>teleconferences, and on-site visits. The team then developed a standardized physician order set.</p> <ul style="list-style-type: none"> The implementation campaign included one-on-one education with staff, posters, e-mail messages, presentations at staff meetings and endorsement by the CEOs at internal meetings. 			
<p><u>Measures addressed:</u> CMS pneumonia measures</p> <p><u>Strategies used:</u></p> <ul style="list-style-type: none"> standardized pre-printed physician orders nursing care maps patient education pneumonia severity scoring system decision protocols to assist in physician treatment decision making. 	<p>Northeast Health Care Quality Foundation (QIO for Maine, Vermont, New Hampshire) working with Maine Hospital Association, New Hampshire Foundation for Healthy Communities and Vermont Association of Hospitals and Health Systems.</p>	<ul style="list-style-type: none"> The QIO assisted all 36 hospitals in Maine, all 26 hospitals in New Hampshire and all 14 hospitals in Vermont to improve care of the most common hospital diagnoses. Local multidisciplinary teams at each hospital developed and implemented standardized pre-printed physician orders, nursing care maps, culture protocols, staff information standards, and patient education information. Local teams developed a pneumonia severity scoring system and decision protocols to assist in physician treatment decision making. 	<ul style="list-style-type: none"> Maine state level data indicate that care for pneumonia improved by 39% New Hampshire state level data indicate that care for pneumonia improved 51%. Vermont state level data indicate that care for pneumonia improved 54%. 	<ul style="list-style-type: none"> All hospitals in the 3 states were included. No breakdown was given by CAH status, but the 3 states have the following number of CAHs: Maine - 15; New Hampshire - 13; and Vermont - 8. 	<p>The American Health Quality Association. Success Stories: Maine. Success Stories: Vermont. Success Stories: New Hampshire.²⁷</p> <p><i>Vermont Health Care Quality Report, 2003.</i>²⁸</p>

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<u>Measures addressed:</u> influenza and pneumococcal vaccinations <u>Strategies used:</u> Standing orders for immunizations	Centers for Disease Control and Prevention	<ul style="list-style-type: none"> Systematic literature reviews by the Task Force on Community Preventive Services and the Southern California Evidence-Based Practice Center-RAND show that standing orders programs improve vaccination rates in hospitals and long term care facilities. 	<ul style="list-style-type: none"> The CDC Advisory Committee on Immunization Practices recommends the use of standing orders programs in both outpatient and inpatient settings. As a result of this recommendation, in 2002 CMS removed the physician signature requirement for influenza and pneumococcal vaccinations from the Conditions of Participation, allowing these vaccines to be administered per physician-approved facility policy after an assessment for contraindications. 	Findings are based on systematic reviews of the literature on interventions to improve vaccination coverage in hospitals and other health care settings, including urban and rural inpatient and outpatient settings.	Briss et al., 2000. ²⁹ Centers for Disease Control, 2003. ³⁰