

Hospital Compare Quality Measures: 2011 National and Michigan Results for Critical Access Hospitals

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Key Findings

National

- Of the 1,328 Critical Access Hospitals (CAHs) operating as of December 31, 2011, a total of 1,059 CAHs (79.7%) reported data to Hospital Compare on at least one inpatient process of care measure for 2011. This total includes 121 CAHs that reported data on ten or fewer patients for all inpatient measures, and had their data suppressed by CMS.
- 362 CAHs (27.3%) reported data on at least one outpatient measure, including 105 CAHs that reported data on ten or fewer patients for all outpatient measures and had their data suppressed by CMS.
- Of the 45 states in the Flex program, twelve states have 100% of CAHs reporting inpatient data while three states have less than half of CAHs reporting. Outpatient reporting ranges from 0% of CAHs in two states to 100% of CAHs in one state.
- 548 CAHs (41.3%) reported data on the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS). HCAHPS reporting ranges from 0% in one state to 100% of CAHs in three states. Eight states have 100% of CAHs reporting HCAHPS data, and seven states have less than half of CAHs reporting.

Michigan

- The inpatient reporting rate for Michigan's 36 CAHs (83.3%) is similar to CAHs nationally. The Michigan reporting rate for outpatient measures (33.3%) is higher than CAHs nationally.
- The Michigan HCAHPS reporting rate (52.8%) is greater than CAHs nationally.
- Compared to quality scores for all other CAHs nationally, Michigan CAHs have:
 - Significantly higher scores on four inpatient measures and zero outpatient measures.
 - Significantly lower scores on four inpatient measures and one outpatient measures.
 - No statistically significant differences for eleven inpatient and two outpatient measures.
 - Insufficient data to compare nine inpatient and one outpatient measures.

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Introduction

Since 2004, acute care hospitals paid under the Medicare Prospective Payment System (PPS) have had a financial incentive to publicly report quality measure data on the Centers for Medicare and Medicaid Services' (CMS) Hospital Compare website. Although Critical Access Hospitals (CAHs) do not face the same financial incentives as PPS hospitals to participate, the Hospital Compare initiative provides an important opportunity for CAHs to assess and improve their performance on national standards of care.

The Hospital Compare quality measures for 2011 include inpatient process of care measures that reflect recommended treatments for acute myocardial infarction (AMI), heart failure, pneumonia, and surgical care improvement, outpatient AMI/chest pain and surgical process of care measures; Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey results; and hospital 30 day risk-adjusted mortality and readmission rates for AMI, heart failure, and pneumonia calculated by CMS using Medicare claims data. Definitions of the process of care measures are included in Appendix A.

At the end of 2011, 1,328 CAHs were located in 45 states. These reports examine state-level CAH participation in Hospital Compare and quality measure results for 2011 as well as trends for 2009-2011 for each state with CAHs. Previous Flex Monitoring Team reports analyzed CAH participation and Hospital Compare inpatient quality measure results nationally for 2004-2010 and at the state level for 2006-2010.¹⁻⁸

The Medicare Beneficiary Quality Improvement Project (MBQIP) was created by the federal Office of Rural Health Policy (ORHP) as a Flex Grant Program activity within the core area of quality improvement. The primary goal of MBQIP is for CAHs to implement quality improvement initiatives to improve their patient care. As of October 2012, a total of 1,085 CAHs had signed a Memorandum of Understanding to participate in MBQIP. The MBQIP Phase 1 and Phase 2 quality measures are a subset of the Hospital Compare measures, and include inpatient pneumonia and heart failure, outpatient AMI/chest pain, and surgery, and HCAHPS measures. The Phase 3 MBQIP measures will be Emergency Department Transfer Communication measures and a Pharmacist CPOE/verification of medication orders within 24 hours measure. Many CAHs are participating in both Hospital Compare and MBQIP, while others are participating in one program but not the other, and some CAHs are still not participating in either program.

Data and Approach

Data on the inpatient and outpatient process of care measures and HCAHPS survey results for January through December 2011, and data on the 3 year (July 2008 to June 2011) mortality and readmission rates calculated by CMS, were downloaded from the CMS Hospital Compare website when they became available in October 2012. These data were linked with previously downloaded data for 2006-2010 and data on all CAHs maintained by the Flex Monitoring Team.

Inpatient and Outpatient Process Measures

For this report, the percentages of patients that received recommended care for the inpatient and outpatient process of care quality measures were calculated by dividing the total number of patients in all CAHs in the state, all CAHs nationally, and all US hospitals who received the recommended care by the total number of eligible patients in all CAHs in the state, all CAHs nationally, and all US hospitals for each measure. Two AMI/chest pain composite measures and two surgical infection composite measures were also created by combining data for individual measures that are used in both inpatient and outpatient settings.

Two outpatient AMI/chest pain measures, time to patient transfer for specialized care and time to ECG, are reported by hospitals as the median number of minutes for eligible patients at that hospital (a lower number of minutes is better). For this report, an average (mean) score was calculated by summing the median times for all CAHs in the state, all CAHs nationally, and all US hospitals, and dividing those times by the number of hospitals reporting.

CMS considers 25 patients to be the minimum number of patients for reliably calculating the process of care measures. Therefore, the percent of CAH patients receiving recommended care was not calculated when the total number of CAH patients in a state, or nationally, with data on a measure was less than 25.

For each measure, the percent of CAH patients receiving recommended care in each state was then compared to the percent of CAH patients that received recommended care in all other states combined. Chi-square tests were used to calculate whether these differences were statistically significant. For each state, the inpatient and outpatient measure scores were classified as: 1) insufficient data (less than 25 patients total); 2) not significantly different than CAHs in all other states; 3) significantly higher than all other CAHs; or 4) significantly lower than all other CAHs. For the two outpatient AMI timing measures, two-sample *t* tests were used to compare the median times for CAHs in each state and all other CAHs.

HCAHPS

HCAHPS is a national, standardized survey of patients' perspectives of hospital care. It was developed by the Agency for Healthcare Research and Quality and CMS to complement other hospital tools designed to support quality improvement. The survey is administered to a random sample of adult patients following discharge from the hospital for inpatient medical, surgical, or maternity care.

Ten HCAHPS measures are publicly reported on the Hospital Compare website. Six composite measures address how well doctors and nurses communicate with patients, the responsiveness of hospital staff, pain management, and communication about medicines. These measures and two individual measures addressing the cleanliness and quietness of the hospital environment are reported in response categories of always, usually, and sometimes/never. Additional measures address the provision of

discharge information (reported as yes/no), an overall rating of the hospital on a 1-10 scale (reported as high (9 or 10), medium (7 or 8), or low (6 or below), and a rating of the patient's willingness to recommend the hospital (reported as definitely would recommend, probably would recommend, and probably/definitely would not recommend.) CMS adjusts the publicly reported HCAHPS results for patient-mix, mode of data collection and non-response bias.⁹

For this report, the percentages of patients reporting the highest response (e.g., always) on each HCAHPS measure were summed and averaged across all reporting CAHs within a state and nationally, and for all reporting hospitals in the U.S.

Mortality and Readmission Rates

CMS calculates hospital-level 30-day risk-standardized mortality and readmission rates for pneumonia, heart failure, and AMI using Medicare fee-for-service claims and enrollment data and statistical modeling techniques. Rates are not calculated for hospitals that are not in the Hospital Compare database or for hospitals with less than 25 qualifying cases over the three-year period.

Both the mortality and the readmission rates are “all-cause” rates (e.g., the mortality rates include deaths from any cause within 30 days and the readmission rates include patients who are readmitted for any cause to a hospital within 30 days after being discharged alive to a non-acute care setting). The CMS statistical models adjust for patient-level risk factors that affect the likelihood of dying or readmission, such as age, gender, past medical history, and having other diseases or conditions. For small hospitals, the models also rely on pooled data from all hospitals treated for the condition, which moves their estimated rates toward the overall U.S. rates for all hospitals. This reduces the chance that for small hospitals will be wrongly classified as worse or better performers, but also makes it less likely that they will fall into either the “better than the national rate” or “worse than the national rate” categories.¹⁰

For this report, the number and percent of CAHs for which CMS did not calculate risk-adjusted mortality rates and readmission rates were determined. The number and percent of CAHs whose rates for each condition were not different than, better than or worse than the national rates, was determined by assessing whether the confidence intervals for the CAH rate for that condition were above, below or included the national rate.

Reporting of Data to Hospital Compare

As in previous years, the percent of CAHs reporting data to Hospital Compare varied considerably across states. In Michigan, 30 of the 36 CAHs in 2011 reported data to Hospital Compare on at least one inpatient process of care measure for 2011 discharges (Table 1). The Michigan participation rate of 83.3% was similar to the national rate of 80%. The 2011 rate was greater than the rate in 2010. (These numbers do not include CAHs that only submit quality measure data to their Quality Improvement

Organization (QIO) or only to the MBQIP program, if they do not allow the data to be publicly reported to Hospital Compare).

Table 1. CAHs Reporting Inpatient and Outpatient Quality Measure Data and HCAHPS Data in Hospital Compare in Michigan and Nationally 2007-2011

	Michigan				National			
	Number of CAHs	Inpatient data	Outpatient data	HCAHPS data	Number of CAHs	Inpatient data	Outpatient data	HCAHPS data
2007	34	19 (55.9%)	N/A	N/A	1293	891 (68.9%)	N/A	N/A
2008	34	21 (61.8%)	N/A	15 (44.1%)	1301	914 (70.3%)	N/A	442 (34.0%)
2009	35	22 (62.9%)	8 (22.9%)	16 (45.7%)	1312	943 (71.9%)	209 (15.9%)	465 (35.4%)
2010	36	28 (77.8%)	10 (27.8%)	17 (47.2%)	1328	977 (73.5%)	282 (21.2%)	505 (38.0%)
2011	36	30 (83.3%)	12 (33.3%)	19 (52.8%)	1328	1,059 (79.7%)	362 (27.3%)	548 (41.3%)

Table 1 also shows that the number of CAHs in Michigan that reported HCAHPS data was 19, for an HCAHPS reporting rate of 52.8%. This rate was greater than the national HCAHPS reporting rate of 41.3% for CAHs.

The number of CAHs in Michigan that reported outpatient data was 12, for an outpatient reporting rate of 33.3%. This rate was greater than the national outpatient reporting rate for CAHs of 27.3%.

CMS recommends that each hospital obtain 300 completed HCAHPS surveys annually, in order to be more confident that the survey results are reliable for assessing the hospital's performance. However, some smaller hospitals may sample all of their HCAHPS-eligible discharges and still have fewer than 300 completed surveys. Table 2 shows the number of completed HCAHPS surveys in 2011 per CAH in Michigan and nationally, in the three categories reported by CMS: "less than 100 surveys", "100 to 299 surveys", and "300 or more surveys." It also shows the survey response rates for the CAHs in Michigan and nationally.

Table 2. Number of Completed HCAHPS Surveys and Response Rates for CAHs in Michigan and Nationally 2011

	Total CAHs reporting HCAHPS data	Number of completed HCAHPS surveys			HCAHPS survey response rates		
		< 100 surveys	100-299 surveys	≥300 surveys	< 25%	25 – 50%	>50%
Michigan	19	7	9	3	0	19	0
National	548	132	309	107	53	476	19

Process of Care Results for CAHs in Michigan and Nationally

For the Hospital Compare inpatient and outpatient process of care measures, the number of CAHs reporting and the number of patients for whom data are available may differ by measure for several reasons. Some measures only apply to a portion of patients (e.g., the smoking cessation advice measures only apply to smokers), and several measures exclude patients with contraindications for receiving that type of medication. Small rural hospitals transfer many AMI patients seen in their emergency departments to larger hospitals, so they may have fewer eligible patients for the inpatient AMI measures. About two-thirds of CAHs provide inpatient surgery. The surgical care improvement measures apply to selected surgeries; some (e.g., hysterectomies) are more commonly provided in CAHs than others (e.g., cardiac procedures).

Tables 3 and 4 display the inpatient and outpatient AMI/chest pain results for 2011 discharges for CAHs in Michigan, CAHs nationally, and all US hospitals. Table 5 shows the inpatient heart failure and pneumonia results, and Table 6 shows the inpatient and outpatient surgical care improvement results.

The number of CAHs reporting AMI inpatient measures has decreased substantially since 2010. Compared to all US hospitals, patients in CAHs are less likely to receive recommended care on the inpatient AMI and heart failure measures. The percentages of patients in CAHs and all US hospitals receiving recommended care are similar for a few pneumonia measures and lower for others. CAH rates are similar to US rates for almost all of the surgical care improvement measures. On the AMI ECG outpatient timing measure, median time to ECG is lower for CAHs.

Statistically Significant Differences between Michigan CAHs and All Other CAHs

When the inpatient and outpatient quality scores for CAHs in Michigan are compared to those of all other CAHs nationally, Michigan CAHs have:

- Significantly higher scores for four inpatient measures (assessment of LVS, initial antibiotics within 6 hours, most appropriate initial antibiotics, preventative antibiotics stopped within 24 hours after surgery) and zero outpatient measures

- Significantly lower scores for four inpatient measures (received appropriate preventative antibiotics, doctors ordered blood clot prevention treatments, received blood clot prevention treatments 24 hours pre/post-surgery, appropriate hair removal) and one outpatient measure (received appropriate antibiotics).
- No significant differences for ten inpatient measures (AMI measures: aspirin at arrival; heart failure: discharge instructions; pneumonia care: pneumococcal vaccination, blood culture prior to first antibiotic, smoking cessation advice, influenza vaccination; surgical care: preventative antibiotics one hour before incision, beta blockers before/after surgery, surgery patients with perioperative temperature management, urinary catheter removed first or second day after surgery); and two outpatient measures (aspirin at arrival; preventative antibiotics 1 hour before incision).
- Insufficient data to compare ten inpatient measures (AMI measures; aspirin at discharge, ACEI or ARB for LVSD, smoking cessation advice, beta blocker at discharge, fibrinolytic within 30 minutes of arrival, PCI at arrival, statin at discharge; heart failure: smoking cessation advice; outpatient fibrinolytic within 30 minutes of arrival; surgical improvement: controlled 6AM post-op blood glucose) and one outpatient measure (AMI measures: Fibrinolytic within 30 minutes of arrival).

Table 3. Hospital Compare Acute Myocardial Infarction Process of Care Results for 2011 Discharges for CAHs in Michigan, All CAHs Nationally, and All US Hospitals

		CAHs in Michigan (n=28)			CAHs Nationally (n=908)			All US Hospitals (n=4,213)		
		Hospitals reporting at least one patient	Total number of patients	Percent of patients receiving recommended care	Hospitals reporting at least one patient	Total number of patients	Percent of patients receiving recommended care	Hospitals reporting at least one patient	Total number of patients	Percent of patients receiving recommended care
Inpatient AMI	Inpatient: Aspirin at arrival	4	49	95.9%	56	735	95.8%	2,554	473,991	99.3%
	Aspirin at discharge	*	*	*	24	274	93.1%	2,310	415,542	99.2%
	ACEI or ARB for LVSD	*	*	*	*	*	*	1,578	69,276	97.6%
	Smoking cessation advice	*	*	*	*	*	*	1,658	134,055	99.8%
	Beta blocker at discharge	*	*	*	22	259	91.9%	2,320	403,746	99.0%
	Inpatient: Fibrinolytic w/in 30 minutes of arrival	*	*	*	*	*	*	34	154	70.8%
	PCI at arrival	*	*	*	*	*	*	1,437	58,896	93.9%
	Statin at Discharge	*	*	*	24	262	76.3%	2,291	401,964	97.5%
Outpatient AMI/Chest Pain	Outpatient: Fibrinolytic w/in 30 minutes of arrival	*	*	*	3	41	78.0%	108	1,715	67.2%
	Outpatient: Aspirin at arrival	11	804	95.6%	252	11,483	96.1%	2,083	131,414	96.6%
Composite Inpatient & Outpatient AMI	Composite: Aspirin at arrival	13	853	95.7%	287	12,218	96.1%	3,357	605,405	98.7%
	Composite: Fibrinolytic w/in 30 minutes of arrival	*	*	*	3	41	78.0%	142	1,869	67.5%

Chart does not include hospitals whose data was suppressed by CMS.

Table 4. Hospital Compare Acute Myocardial Infarction Time-Relevant Process of Care Results for 2011 Discharges for CAHs in Michigan, All CAHs Nationally, and All US Hospitals

		CAHs in Michigan (n=11)			CAHs Nationally (n=257)			All US Hospitals (n=3,397)		
		Hospitals reporting at least one patient	Total number of patients	Average minutes	Hospitals reporting at least one patient	Total number of patients	Average minutes	Hospitals reporting at least one patient	Total number of patients	Average minutes
Outpatient AMI/Chest Pain	OP Median Time to Fibrinolysis	*	*	*	3	41	20.3	107	1,698	27.2
	Median mins before OP with CP/AMI transferred	3	38	68.0	19	289	72.9	406	7,623	65.7
	Median mins to ECG for OP with CP/AMI	11	853	8.6	253	12,011	8.7	2,103	136,624	9.7

Chart does not include hospitals whose data was suppressed by CMS.

Table 5. Hospital Compare Heart Failure and Pneumonia Process of Care Results for 2011 Discharges for CAHs in Michigan, All CAHs Nationally, and All US Hospitals

		CAHs in Michigan (n=28)			CAHs Nationally (n=908)			All US Hospitals (n=4,213)		
		Hospitals reporting at least one patient	Total number of patients	Percent of patients receiving recommended care	Hospitals reporting at least one patient	Total number of patients	Percent of patients receiving recommended care	Hospitals reporting at least one patient	Total number of patients	Percent of patients receiving recommended care
Heart Failure	Discharge instructions	17	532	87.2%	529	11,884	84.2%	3,621	588,772	92.3%
	Assessment of LVS	19	703	94.5%	669	18,840	87.9%	3,779	735,041	98.8%
	ACE inhibitor or ARB for LVSD	7	94	84.0%	178	2,197	88.0%	2,982	221,310	96.3%
	Smoking cessation advice	*	*	*	72	536	90.9%	2,580	119,749	99.4%
Pneumonia	Pneumococcal vaccination	28	1,149	89.6%	853	29,971	90.0%	3,977	518,736	95.8%
	Blood culture prior to first antibiotic	27	1,202	95.4%	654	23,529	94.4%	3,725	539,177	97.0%
	Smoking cessation advice	20	369	91.9%	396	6,666	91.7%	3,394	205,607	98.5%
	Initial antibiotic(s) within 6 hours	26	1,081	97.3%	755	28,044	95.9%	3,848	546,858	96.3%
	Most appropriate initial antibiotic(s)	28	922	94.0%	773	22,387	89.4%	3,883	343,871	94.9%
	Influenza vaccination	16	285	90.5%	427	6,694	89.1%	3,401	173,172	94.0%

Chart does not include hospitals whose data was suppressed by CMS.

**Table 6. Hospital Compare Surgical Care Improvement Process of Care Results for 2011 Discharges
for CAHs in Michigan, All CAHs Nationally, and All US Hospitals**

		CAHs in Michigan (n=28)			CAHs Nationally (n=908)			All US Hospitals (n=4,213)		
		Hospitals reporting at least one patient	Total number of patients	Percent of patients receiving recommended care	Hospitals reporting at least one patient	Total number of patients	Percent of patients receiving recommended care	Hospitals reporting at least one patient	Total number of patients	Percent of patients receiving recommended care
Inpatient Surgical Care Improvement	Inpatient: Preventative antibiotic(s) 1 hour before incision	13	561	96.6%	320	18,784	95.1%	3,375	1,044,459	98.2%
	Inpatient: Received appropriate preventative antibiotic(s)	12	556	95.9%	317	18,815	97.6%	3,371	1,056,007	98.4%
	Preventative antibiotic(s) stopped within 24 hours after surgery	12	539	96.7%	315	18,355	94.4%	3,364	1,009,607	97.0%
	Doctors ordered blood clot prevention treatments	14	525	93.1%	335	18,553	95.6%	3,433	975,622	97.8%
	Received blood clot prevention treatments 24 hours pre/post surgery	14	523	92.7%	333	18,431	95.2%	3,428	974,043	96.9%
	Controlled 6AM post-op blood glucose	*	*	*	*	*	*	1,161	170,300	95.4%
	Appropriate Hair Removal	15	780	95.5%	366	25,169	99.5%	3,485	1,539,368	99.9%
	Beta blockers before/after surgery	7	173	94.2%	207	5,398	92.1%	3,133	455,100	96.3%
	Urinary Catheter removed 1st/2nd day after surgery	11	397	94.7%	265	12,171	93.9%	3,257	772,890	93.9%
	Surgery Patients with Perioperative Temperature Management	15	818	99.1%	370	25,981	98.8%	3,490	1,414,070	99.6%
Outpatient Surgical Care Improvement	Outpatient: Preventative antibiotic(s) 1 hour before incision	3	146	91.8%	70	2,239	88.8%	2,892	689,401	96.2%
	Outpatient: Received appropriate preventative antibiotic(s)	3	144	78.5%	75	2,345	93.2%	2,896	704,021	96.3%
Composite of Inpatient & Outpatient Surgical Care Improvement	Composite: Preventative antibiotic(s) 1 hour before incision	14	707	95.6%	334	21,023	94.5%	3,428	1,733,860	97.4%
	Composite: Received appropriate preventative antibiotic(s)	13	700	92.3%	332	21,160	97.1%	3,427	1,760,028	97.6%

Chart does not include hospitals whose data was suppressed by CMS.

HCAHPS Survey Results for CAHs in Michigan and Nationally

Table 7 displays the mean (average) percentages of patients that gave the highest level of response (e.g., “always”) for each of the HCAHPS survey measures in three groups of hospitals that publicly reported HCAHPS data for 2011: CAHs in Michigan, CAHs nationally, and all US hospitals.

Compared to all US hospitals, CAHs nationally had greater percentages of patients that assessed their experiences receiving care positively, i.e. gave the highest level of response for each of the HCAHPS survey measures.

Caution should be exercised in comparing HCAHPS results for states that have few CAHs reporting results and/or CAHs whose results are based on fewer than 100 completed surveys.

Table 7 also shows that the number of CAHs in Michigan that reported HCAHPS data was 19, for an HCAHPS reporting rate of 52.8%. This rate was greater than the national HCAHPS reporting rate of 41% for CAHs.

Table 7. HCAHPS Results for 2011 for CAHs in Michigan and Nationally and all US Hospitals

Percent of patients who reported that:	Mean (average) for:		
	Michigan CAHs (n=19)	CAHs Nationally (n=548)	All US Hospitals (n=4,609)
Nurses always communicated well	82%	81%	77%
Doctors always communicated well	83%	85%	81%
Patient always received help as soon as wanted	77%	74%	65%
Pain was always well controlled	76%	73%	70%
Staff always explained about medications before giving them to patient	66%	67%	62%
Yes, staff gave patient information about what to do during recovery at home	88%	85%	83%
Area around patient room was always quiet at night	65%	64%	59%
Patient room and bathroom were always clean	79%	80%	72%
They gave an overall hospital rating of 9 or 10 (high) on 1-10 scale	75%	73%	69%
They would definitely recommend the hospital to friends and family	71%	73%	70%

Mortality and Readmission Rate Categories for CAHs in Michigan and Nationally

Table 8 displays the number of CAHs in Michigan and nationally 1) that did not have mortality data in Hospital Compare for AMI, heart failure, and/or pneumonia; 2) those that did not have the minimum 25 eligible cases per condition over the 3 year period from July 2008 to June 2011 to reliably calculate a rate; and 3) those that had rates that were not different from, better than or worse than the US rates for all hospitals.

Nationally, 93% of CAHs either were missing AMI mortality data or had too few cases to reliably calculate a rate; the remaining 7% of CAHs did not have an AMI mortality rate that is different from the US rate for all hospitals. More CAHs had the minimum number of patients to reliably calculate mortality rates for heart failure (57%) and pneumonia (76%). However, few CAHs had mortality rates that are either better than or worse than the US rates for all hospitals (less than 1% of CAHs for heart failure and 3% of CAHs for pneumonia).

Table 8. Number (Percent) of CAHs in Michigan and Nationally in Risk-adjusted Mortality Rate Categories

		Number of CAHs with:					
		Total	No rate data in Hospital Compare	Not enough cases to reliably calculate	Not different from U.S. rate for all hospitals	Better than U.S. rate for all hospitals	Worse than U.S. rate for all hospitals
AMI	Michigan CAHs	36	7 (19.4%)	26 (72.2%)	3 (8.3%)	0	0
	CAHs Nationally	1328	295 (22.2%)	944 (71.1%)	89 (6.7%)	0	0
Heart Failure	Michigan CAHs	36	4 (11.1%)	7 (19.4%)	25 (69.4%)	0	0
	CAHs Nationally	1328	204 (15.4%)	371 (27.9%)	741 (55.8%)	0	12 (0.9%)
Pneumonia	Michigan CAHs	36	4 (11.1%)	2 (5.6%)	29 (80.6%)	0	1 (2.8%)
	CAHs Nationally	1328	198 (14.9%)	116 (8.7%)	970 (73.0%)	1 (0.1%)	43 (3.2%)

Table 9 shows the 30-day risk-adjusted readmission rates for AMI, heart failure, and pneumonia for CAHs in Michigan and nationally. For AMI, 97.6% of CAHs either were missing AMI readmission data or had too few cases to reliably calculate a rate, and the remaining 2.4% of CAHs did not have a rate that is different from the US rate for all hospitals. More CAHs had the minimum number of patients to reliably calculate readmission rates for heart failure (61%) and pneumonia (77%), but few CAHs had readmission rates that are either better than or worse than the US rates for all hospitals (0.1% of CAHs for heart failure and 0.3% of CAHs for pneumonia).

Table 9. Number (Percent) of CAHs in Michigan and Nationally in Risk-adjusted Readmission Rate Categories

		Number of CAHs with:					
		Total	No rate data in Hospital Compare	Not enough cases to reliably calculate	Not different from U.S. rate for all hospitals	Better than U.S. rate for all hospitals	Worse than U.S. rate for all hospitals
AMI	Michigan CAHs	36	6 (16.7%)	30 (83.3%)	0	0	0
	CAHs Nationally	1328	340 (25.6%)	956 (72.0%)	32 (2.4%)	0	0
Heart Failure	Michigan CAHs	36	5 (13.9%)	4 (11.1%)	27 (75.0%)	0	0
	CAHs Nationally	1328	205 (15.4%)	309 (23.3%)	813 (61.2%)	0	1 (0.1%)
Pneumonia	Michigan CAHs	36	4 (11.1%)	2 (5.6%)	30 (83.3%)	0	0
	CAHs Nationally	1328	198 (14.9%)	105 (7.9%)	1021 (76.9%)	1 (0.1%)	3 (0.2%)

Trends over Time

The figures in Appendix B compare the Michigan and national data trends for CAHs for 2009, 2010 and 2011. The percentages for each year are based on all CAH patients for whom data were reported that year. Again, data are not shown for measures with fewer than 25 patients per year.

Over this time period, the percentage of CAH patients nationally that received recommended care increased for all process of care measures. Some states may have greater year-to-year fluctuation in results due to small sample sizes for some measures.

Discussion and Conclusions

The percent of CAHs reporting publicly on inpatient process of care measures increased from 73.5% for 2010 to 79.7% for 2011. Public reporting of outpatient process measures also increased from 21.2% of CAHs for 2010 to 27.3% for 2011. CAH reporting of HCAHPS measures increased a little, from 38% in 2010 to 41.3% in 2011.

As with previous years, there was wide variation across the 45 Flex states in CAH reporting. For inpatient measures, 13 states had 100% of CAHs reporting while three states had less than half of CAHs reporting. Outpatient reporting ranged from 0% of CAHs in two states to 100% in one state, and HCAHPS reporting ranged from 0% in one state to 100% of CAHs in three states.

Quality measurement is an important component of health care reform efforts. CAHs will need to report quality measures to show meaningful use of electronic health records (EHRs) and to participate in payment reform initiatives, such as Accountable Care Organizations. In states where CAH reporting is lower than the national average, additional state initiatives may be necessary to encourage reporting. Efforts to assist CAHs in quality reporting are underway as part of the MBQIP project and Quality Improvement Organizations' (QIO) 10th Scope of Work.

For 2011 discharges, CMS instituted a policy of suppressing Hospital Compare data for hospitals that reported data for ten or fewer patients on a measure. As a consequence, 121 CAHs had their data suppressed for all inpatient measures and 105 CAHs had their data suppressed for all outpatient measures. The CMS data suppression policy results in a significant number of CAHs being excluded from ongoing monitoring of CAH quality performance at the hospital, state and national levels. The CMS policy also limits the data available to address small volume issues in CAH quality measurement through alternatives such as aggregating data over time and creating composite measures by condition.

Hospital Compare and MBQIP have several pneumonia and heart failure measures in common. Hospital Compare also includes several additional quality measures that are relevant to CAHs. ORHP encourages CAHs to participate in both MBQIP and public reporting to Hospital Compare, and to report on all cases, regardless of low volume. MBQIP includes all cases reported by CAHs, with no data suppression. As MBQIP continues to be implemented and more CAHs begin to participate in MBQIP, CAH reporting to Hospital Compare will continue to be tracked and monitored.

CMS also made several changes to the Hospital Compare inpatient quality measure set that became effective starting with 2012 discharges.¹¹ These changes included:

- Retiring the pneumonia initial antibiotic timing measure due to concerns about potential incentives to overuse antibiotics.
- Retiring the pneumonia, heart failure and AMI smoking cessation advice measures and the pneumonia influenza and pneumococcal vaccination measures.
- Suspending data collection for three inpatient AMI measures (aspirin at arrival, ACEI/ARB for LVSD, and beta blocker at discharge) because performance was uniformly high nationwide (although CAH performance is not as high as other hospitals).
- Adding two new global influenza and pneumococcal vaccination measures.

The CMS changes to the Hospital Compare measure set are reducing the number of quality measures for pneumonia and heart failure, which are the most common inpatient conditions in CAHs, while adding new inpatient and outpatient measures for other conditions that are relevant to CAHs. Future reports will reflect these changes and monitor their impact on CAH participation in public reporting and quality performance.

References

1. Casey, M. and Moscovice, I. *CAH Participation in Hospital Compare and Initial Results*. Flex Monitoring Team Briefing Paper No. 9, February 2006.
2. Casey, M., Burlew, M. and Moscovice, I. *Critical Access Hospital Year 2 Hospital Compare Participation and Quality Measure Results*. Flex Monitoring Team Briefing Paper No. 16, April 2007.
3. Casey, M., Burlew, M. and Moscovice, I. *Critical Access Hospital Year 3 Hospital Compare Participation and Quality Measure Results*. Flex Monitoring Team Briefing Paper No. 20, August 2008.
4. Casey, M., Burlew, M. and Moscovice, I. *Critical Access Hospital Year 4 Hospital Compare Participation and Quality Measure Results*. Flex Monitoring Team Briefing Paper No. 22, October 2009.
5. Casey, M., Burlew, M. and Moscovice, I. *Critical Access Hospital Year 5 Hospital Compare Participation and Quality Measure Results*. Flex Monitoring Team Briefing Paper No. 26, March 2010.
6. Casey, M., Burlew, M. and Moscovice, I. *Critical Access Hospital Year 6 Hospital Compare Participation and Quality Measure Results*. Flex Monitoring Team Briefing Paper No. 28, April 2011.
7. Casey, M., Barton, B., Hung, P. and Moscovice, I. *Critical Access Hospital Year 7 Hospital Compare Participation and Quality Measure Results*. Flex Monitoring Team Briefing Paper No. 30, April 2012.
8. State level reports are available on the Flex Monitoring Team website at <http://www.flexmonitoring.org/indicators.shtml>
9. Centers for Medicare and Medicaid Services (CMS). HCAHPS Fact Sheet. May 2012. Available at: <http://www.hcahpsonline.org/files/HCAHPS%20Fact%20Sheet%20May%202012.pdf>
10. Measure Methodology Reports: Mortality Measures and Readmission Measures Overview. Available at: www.qualitynet.org.
11. CMS. Specifications Manual for National Hospital Inpatient Quality Measures Discharges 01-01-12 (1Q121Q12) through 12-31-12 (4Q124Q12). Available at www.qualitynet.org.

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Appendix A: Definitions of Current Hospital Compare Process Measures

AMI - Heart Attack and Chest Pain

Aspirin at arrival – Acute myocardial infarction (AMI) patients without aspirin contraindications who received aspirin within 24 hours before or after hospital arrival. (Is both an inpatient and outpatient measure.)

Aspirin at discharge – AMI patients without aspirin contraindications who were prescribed aspirin at hospital discharge.

ACEI or ARB for LVSD – (Angiotensin Converting Enzyme [ACE] Inhibitor or Angiotensin Receptor Blocker [ARB] for Left Ventricular Systolic Dysfunction) - AMI patients with left ventricular systolic dysfunction (LVSD) and without angiotensin converting enzyme inhibitor (ACE inhibitor) contraindications or angiotensin receptor blocker (ARB) contraindications who are prescribed an ACE inhibitor or an ARB at hospital discharge.

Beta blocker at discharge – AMI patients without beta-blocker contraindications who were prescribed a beta-blocker at hospital discharge.

Fibrinolytic medication within 30 minutes of arrival – AMI patients receiving fibrinolytic therapy during the hospital stay and having a time from hospital arrival to fibrinolysis of 30 minutes or less (this is both an inpatient and outpatient measure.)

PCI at arrival – Percutaneous Coronary Intervention (PCI) Received within 90 Minutes of Hospital Arrival - AMI patients receiving Percutaneous Coronary Intervention (PCI) during the hospital stay with a time from hospital arrival to PCI of 90 minutes or less.

Smoking cessation Advice – AMI patients with a history of smoking cigarettes, who are given smoking cessation advice or counseling during a hospital stay.

Time to transfer for specialized care – median time to transfer to another facility for acute coronary intervention (this is only an outpatient measure.) Median number of minutes before outpatients with heart attack who needed specialized care were transferred to another hospital (a lower number of minutes is better)

Time to ECG – (This is only an outpatient measure.) Median number of minutes before outpatients with heart attack (or with chest pain that suggest a possible heart attack) got an ECG (a lower number of minutes is better)

Statin at discharge - AMI patients who are prescribed a statin at hospital discharge.

Heart Failure

Discharge instructions – Heart failure patients discharged home with written instructions or educational material given to patient or care giver at discharge or during the hospital stay addressing all of the following: activity level, diet, discharge

Appendix A: Definitions of Current Hospital Compare Process Measures

medications, follow-up appointment, weight monitoring, and what to do if symptoms worsen

Assessment of LVS – Evaluation of left ventricular systolic (LVS) function - Heart failure patients with documentation in the hospital record that an evaluation of the left ventricular systolic (LVS) function was performed before arrival, during hospitalization, or is planned for after discharge.

ACE inhibitor or ARB for LVSD – Heart failure patients with left ventricular systolic dysfunction (LVSD) and without angiotensin converting enzyme inhibitor (ACE inhibitor) contraindications or angiotensin receptor blocker (ARB) contraindications who are prescribed an ACE inhibitor or an ARB at hospital discharge.

Smoking cessation advice – Heart failure patients with a history of smoking cigarettes, who are given smoking cessation advice or counseling during a hospital stay.

Pneumonia

Pneumococcal vaccination – Pneumonia inpatients age 65 and older who were screened for pneumococcal vaccine status and were administered the vaccine prior to discharge, if indicated.

Blood culture prior to first antibiotic – Cultures performed in the emergency department prior to initial antibiotic received in hospital - Pneumonia patients whose initial emergency room blood culture specimen was collected prior to first hospital dose of antibiotics.

Smoking cessation advice – Pneumonia patients with a history of smoking cigarettes, who are given smoking cessation advice or counseling during a hospital stay.

Initial antibiotics within six hours – Pneumonia inpatients that receive within 6 hours after arrival at the hospital. Evidence shows better outcomes for administration times less than four hours.

Most appropriate initial antibiotics – Immunocompetent patients with pneumonia who receive an initial antibiotic regimen that is consistent with current guidelines.

Influenza vaccination – Pneumonia patients age 50 years and older, hospitalized during October, November, December, January, or February who were screened for influenza vaccine status and were vaccinated prior to discharge, if indicated.

Surgical Care Improvement Project

Preventative antibiotics one hour before incision – Surgical patients who received prophylactic antibiotics within 1 hour prior to surgical incision. (This is both an inpatient and outpatient measure.)

Appendix A: Definitions of Current Hospital Compare Process Measures

Received appropriate preventative antibiotics – Prophylactic antibiotic selection – Surgical patients who received the recommended antibiotics for their particular type of surgery. (This is both an inpatient and outpatient measure.)

Preventative antibiotics stopped within 24 hours after surgery – Prophylactic antibiotics discontinued within 24 hours after surgery end time – Surgical patients whose prophylactic antibiotics were discontinued within 24 hours after surgery end time.

Doctors ordered blood clot prevention treatments – Surgery patients with recommended venous thromboembolism prophylaxis ordered – Surgery patients with recommended venous thromboembolism (VTE) prophylaxis ordered anytime from hospital arrival to 48 hours after *Surgery End Time*.

Received blood clot prevention treatments 24 hours pre/post-surgery – Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours prior to surgery to 24 hours after surgery – Surgery patients who received appropriate venous thromboembolism (VTE) prophylaxis within 24 Hours prior to *Surgical Incision Time* to 24 Hours after *Surgery End Time*.

Controlled 6AM post-op blood glucose – Cardiac surgery patients with controlled 6 A.M. postoperative blood glucose – Cardiac surgery patients with controlled 6 A.M. blood glucose (≤ 200 mg/dL) on postoperative day one (POD 1) and postoperative day two (POD 2) with *Surgery End Date* being postoperative day zero (POD 0).

Surgery patients with appropriate hair removal – Surgery patients with appropriate surgical site hair removal. No hair removal, or hair removal with clippers or depilatory is considered appropriate. Shaving is considered inappropriate.

Beta blockers before/after surgery – Surgery patients on a beta blocker prior to arrival who received a beta blocker during the perioperative period – Surgery patients who were taking heart drugs called beta blockers before coming to the hospital, who were kept on the beta blockers during the period just before and after their surgery.

Urinary Catheter removed 1st/2nd day after surgery – Inpatients whose urinary catheters were removed within 2 days after surgery to reduce the risk of infections – Shows the percent of surgery patients whose urinary catheters were removed on the first or second day after surgery.

Surgery Patients with Perioperative Temperature Management - Surgery patients for whom either active warming was used intraoperatively for the purpose of maintaining normothermia or who had at least one body temperature equal to or greater than 96.8° Fahrenheit/36° Celsius recorded within the 30 minutes immediately prior to or the 15 minutes immediately after *Anesthesia End Time*.

Source: Specifications Manual for National Hospital Quality Measures. Available at: <http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPPage%2FQnetTier4&cid=1228771525863>. Accessed February 5, 2013.

Appendix B: Three Year Trends in Inpatient and Outpatient Measures

Figure 1. AMI: Aspirin at Arrival

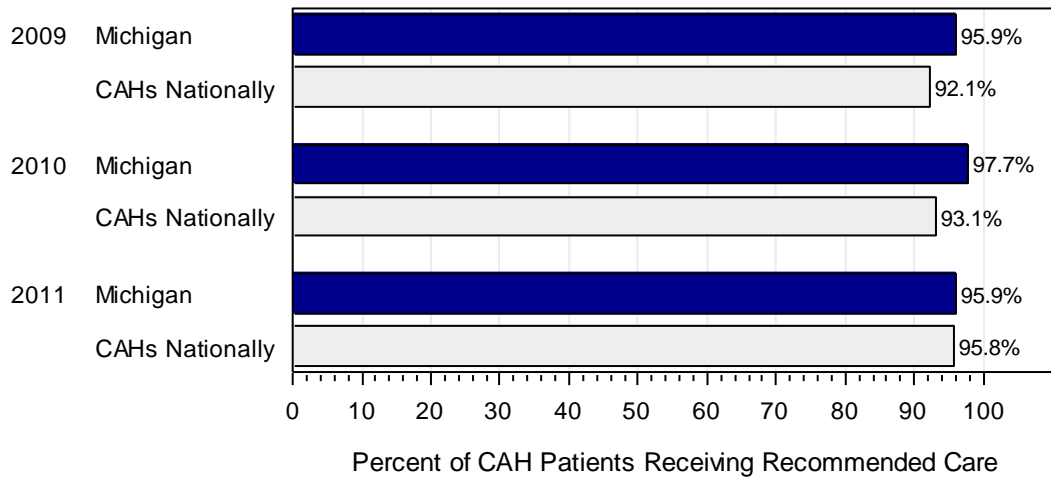


Figure 2. AMI: Aspirin at Discharge

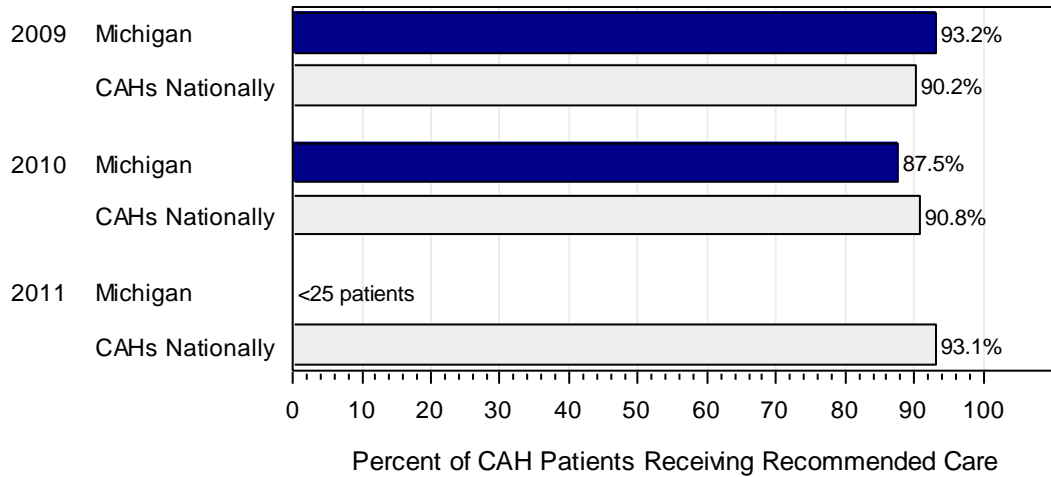
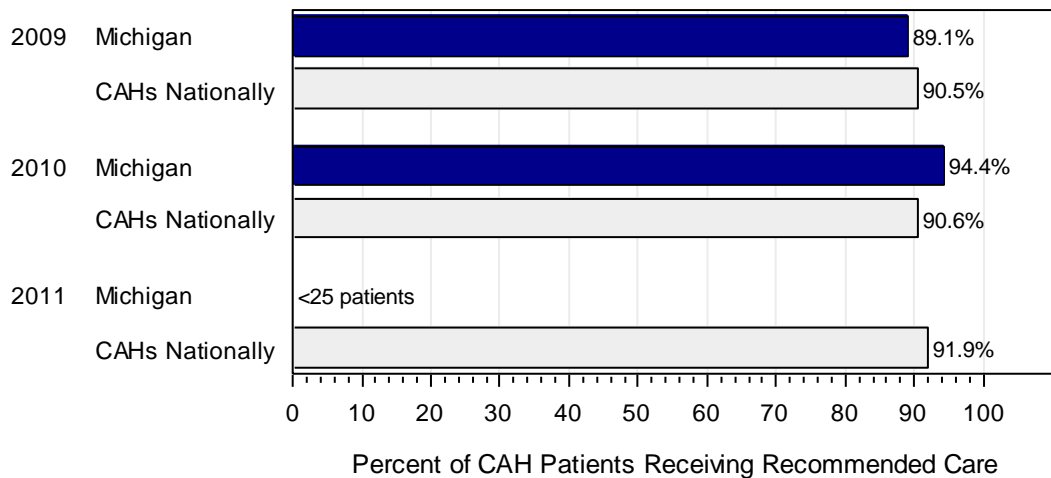


Figure 3. AMI: Beta Blocker at Discharge



Appendix B: Three Year Trends in Inpatient and Outpatient Measures

Figure 4. Heart Failure: Discharge Instructions

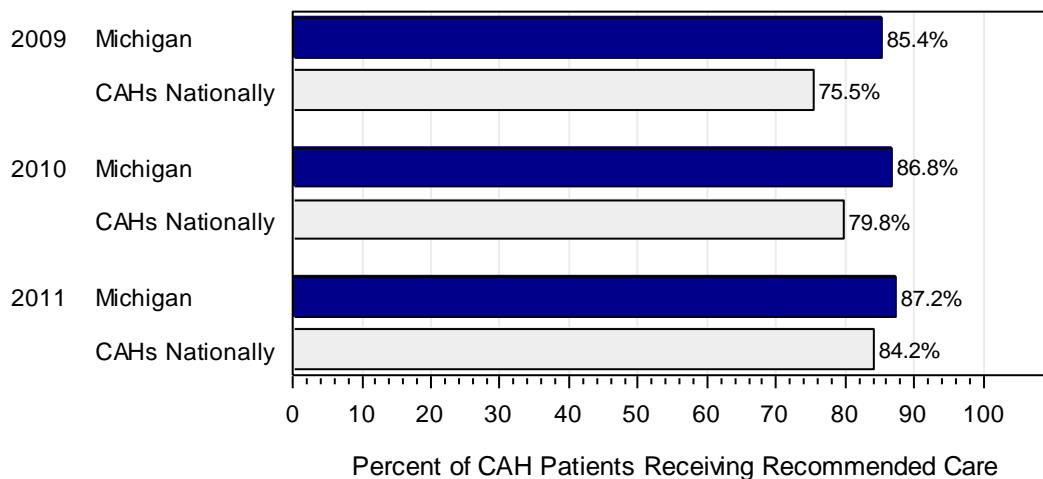


Figure 5. Heart Failure: Assessment of LVS

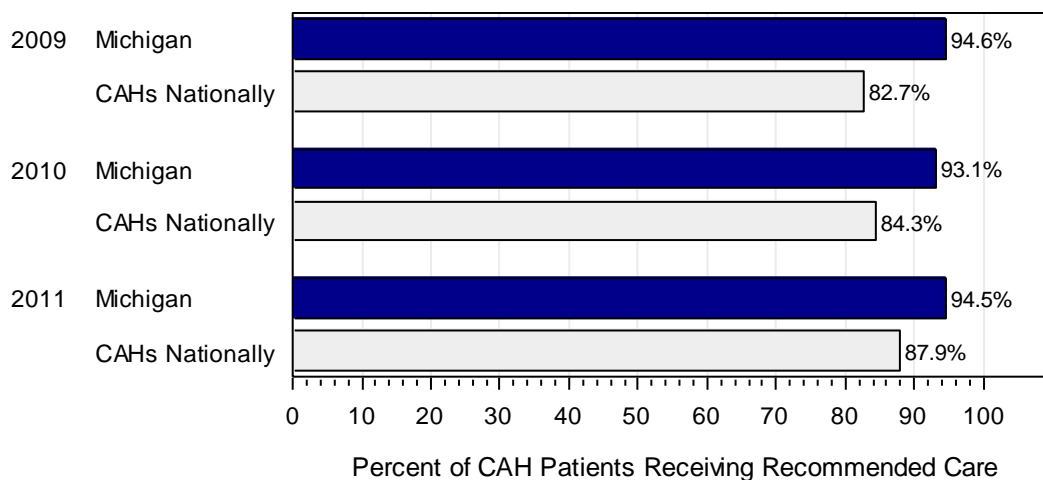
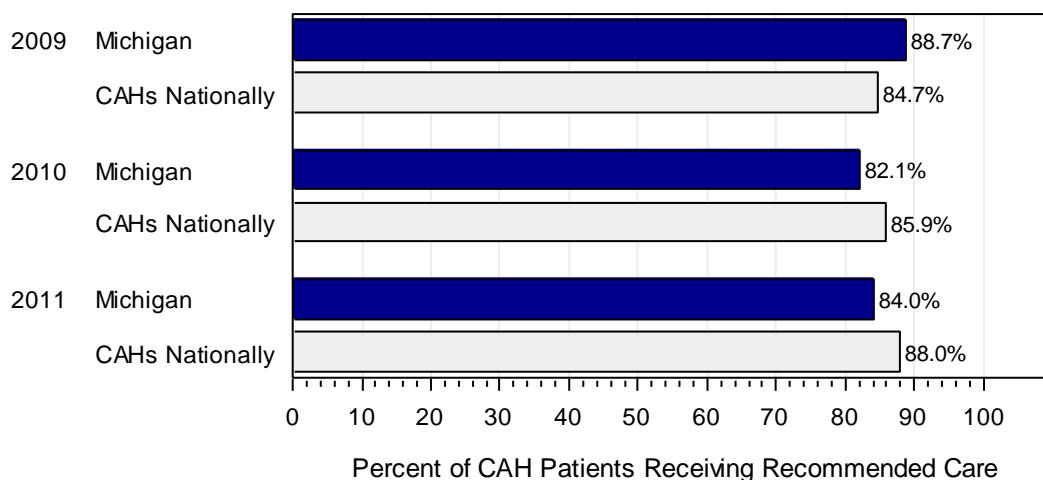


Figure 6. Heart Failure: ACE Inhibitor or ARB for LVSD



Appendix B: Three Year Trends in Inpatient and Outpatient Measures

Figure 7. Heart Failure: Smoking Cessation Advice

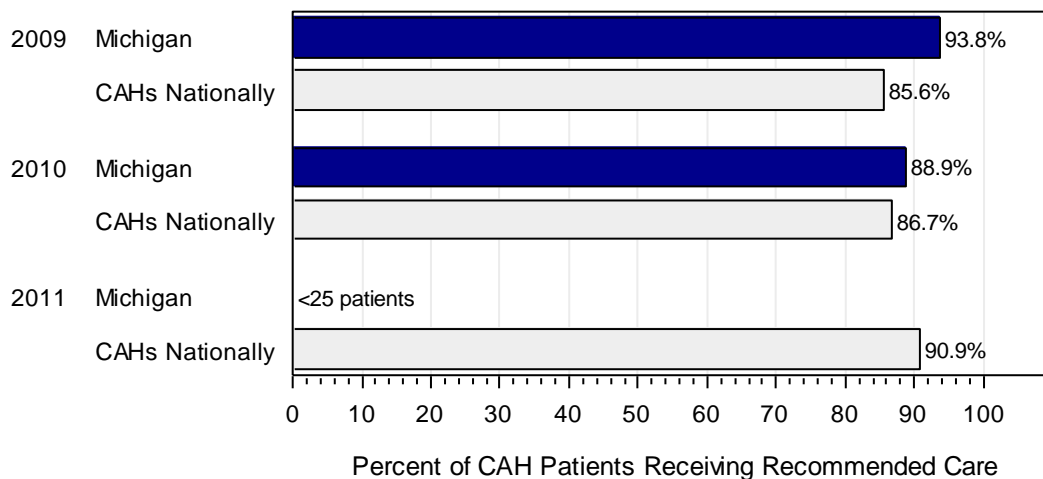


Figure 8. Pneumonia: Pneumococcal Vaccination

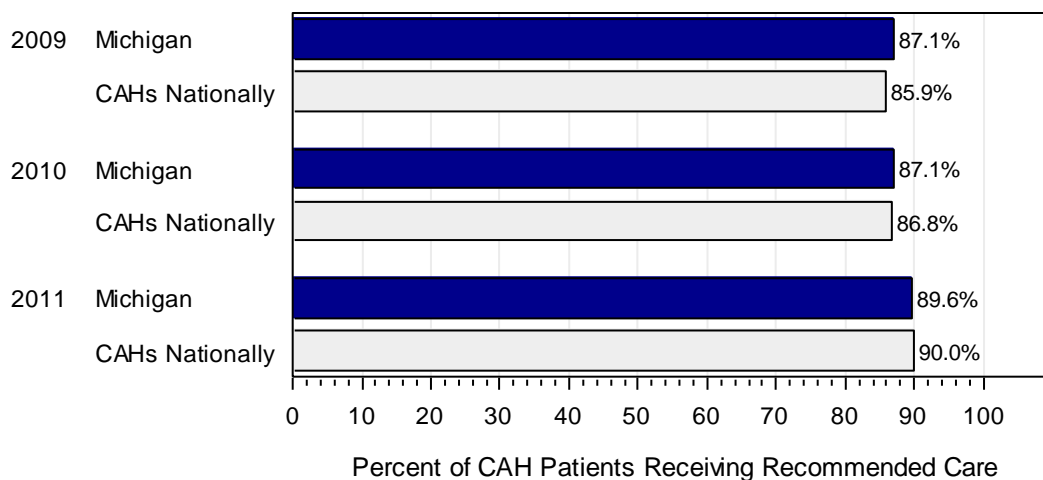
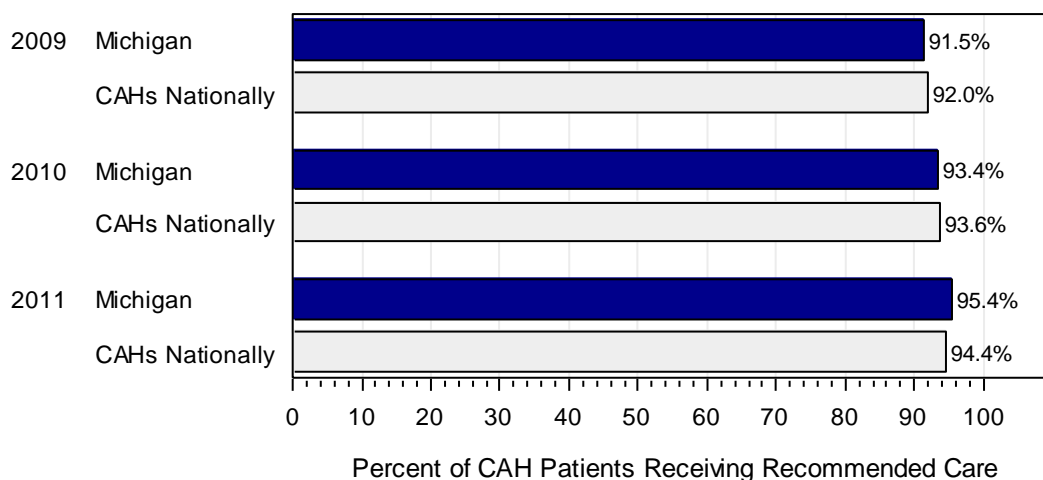


Figure 9. Pneumonia: Blood Culture Prior to First Antibiotic



Appendix B: Three Year Trends in Inpatient and Outpatient Measures

Figure 10. Pneumonia: Smoking Cessation Advice

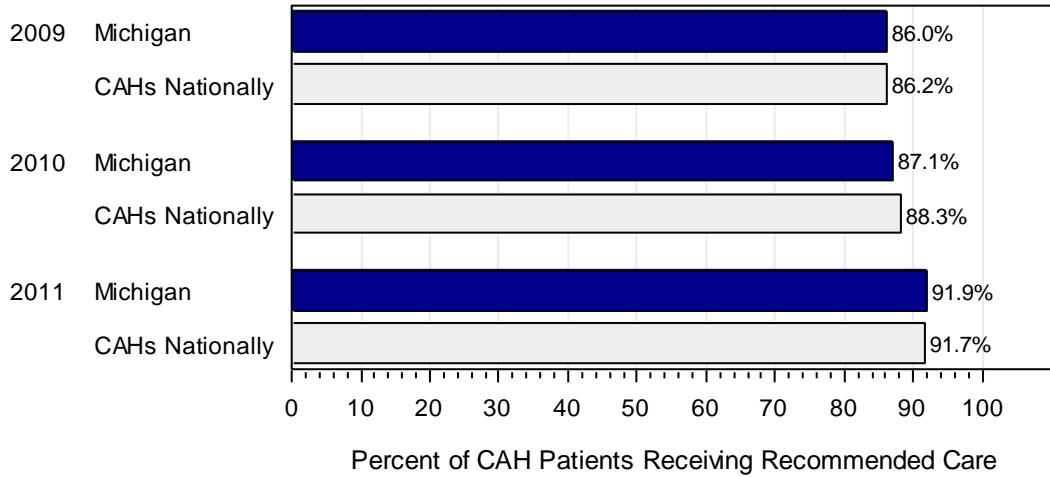


Figure 11. Pneumonia: Timely Administration of Initial Antibiotic

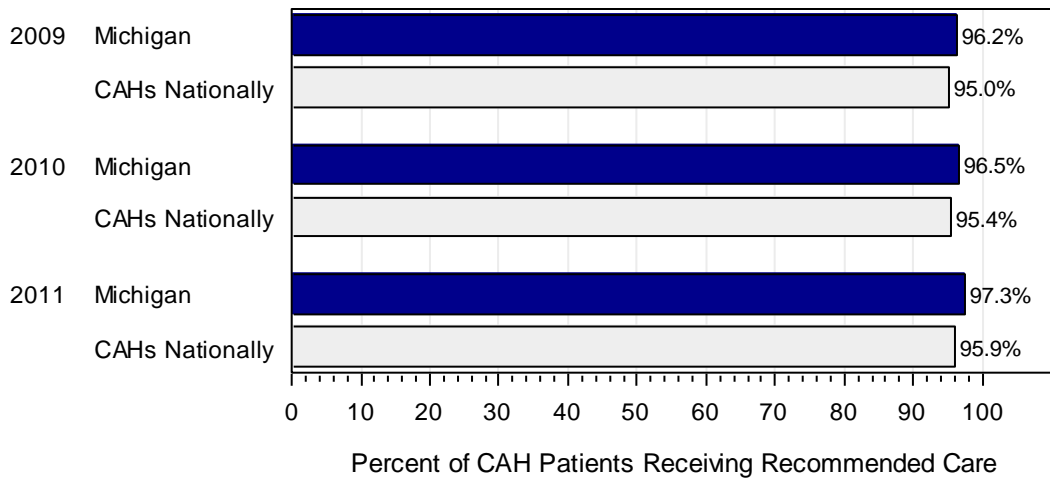
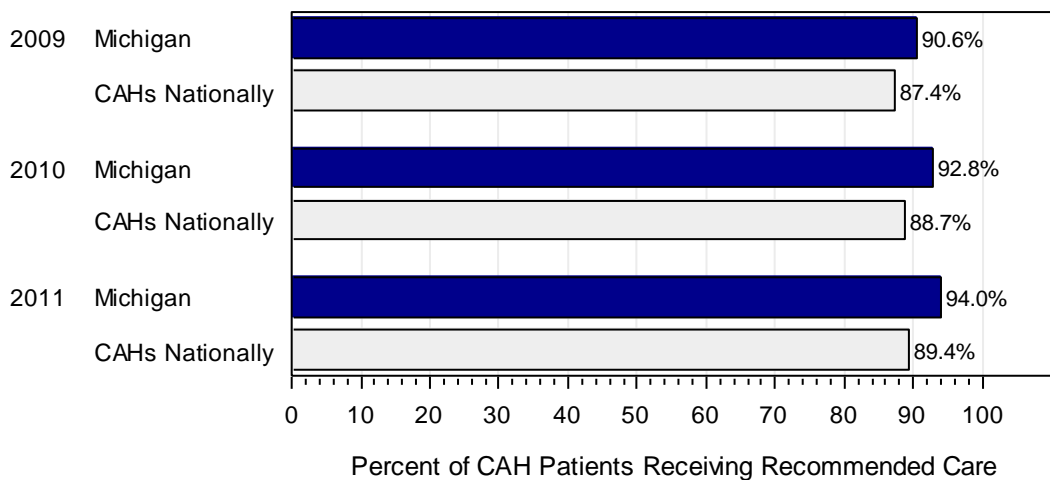


Figure 12. Pneumonia: Most Appropriate Initial Antibiotic(s)



Appendix B: Three Year Trends in Inpatient and Outpatient Measures

Figure 13. Pneumonia: Influenza Vaccination

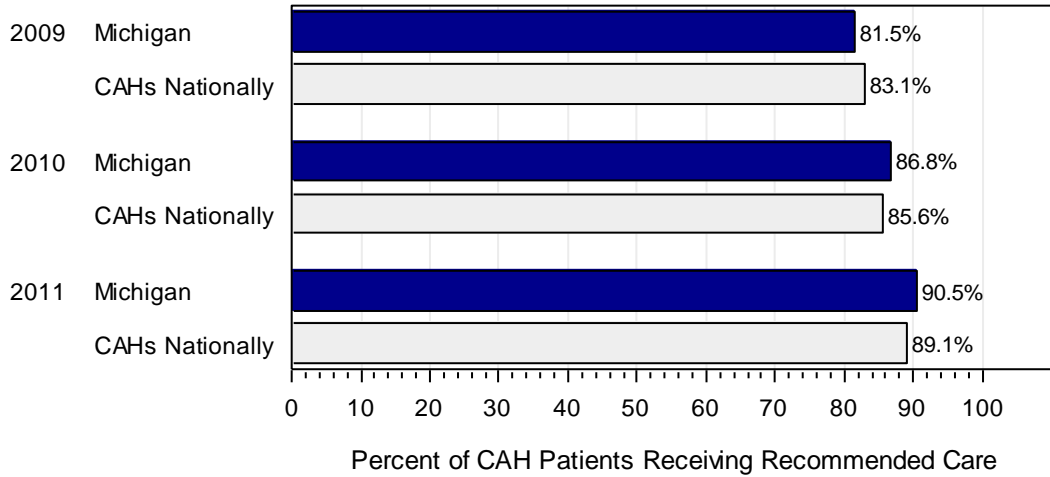


Figure 14. Surgical Care Improvement: Preventative Antibiotic(s) One Hour before Incision

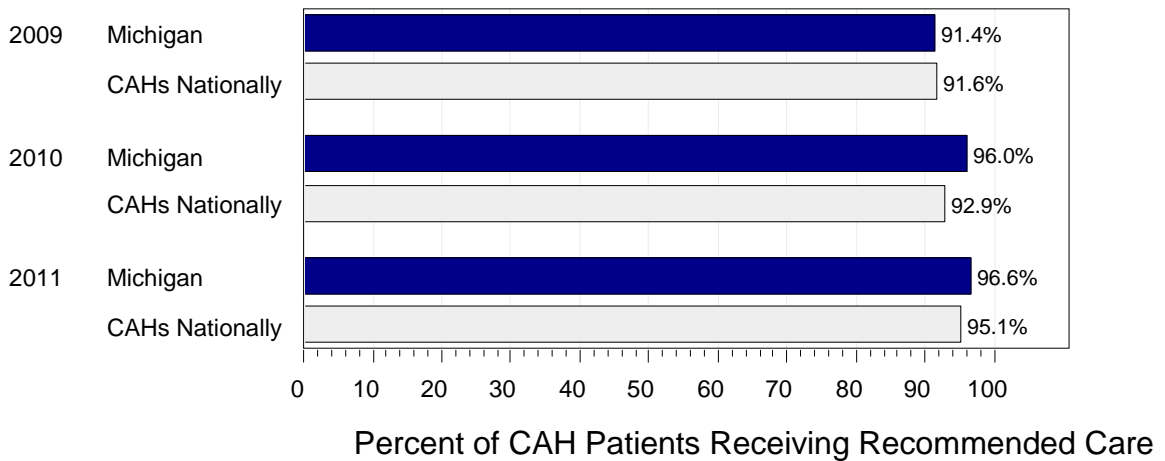
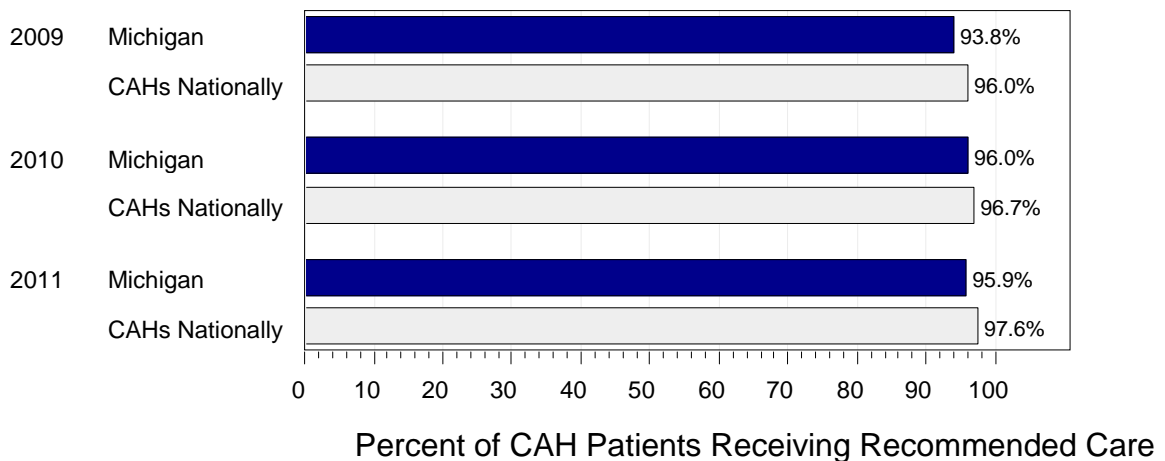


Figure 15. Surgical Care Improvement: Received Appropriate Preventative Antibiotic(s)



Appendix B: Three Year Trends in Inpatient and Outpatient Measures

Figure 16. Surgical Care Improvement: Preventative Antibiotic(s) Stopped w/in 24 Hours Post Surgery

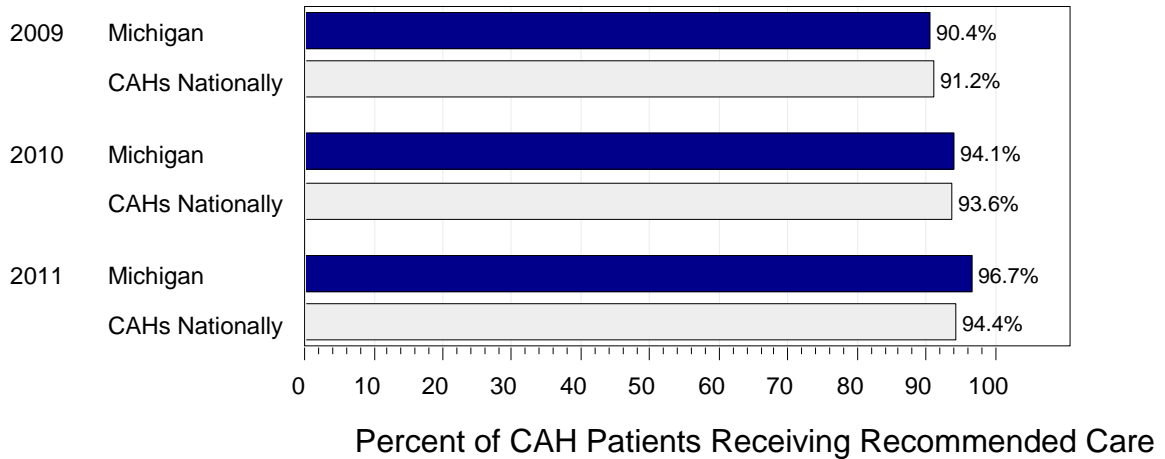


Figure 17. Surgical Care Improvement: Doctors Ordered Blood Clot Prevention Treatments

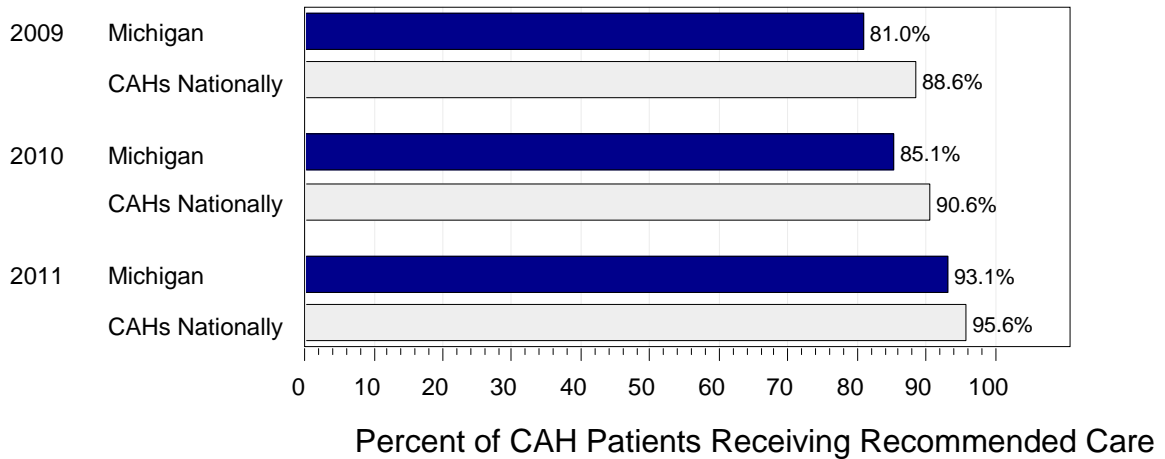
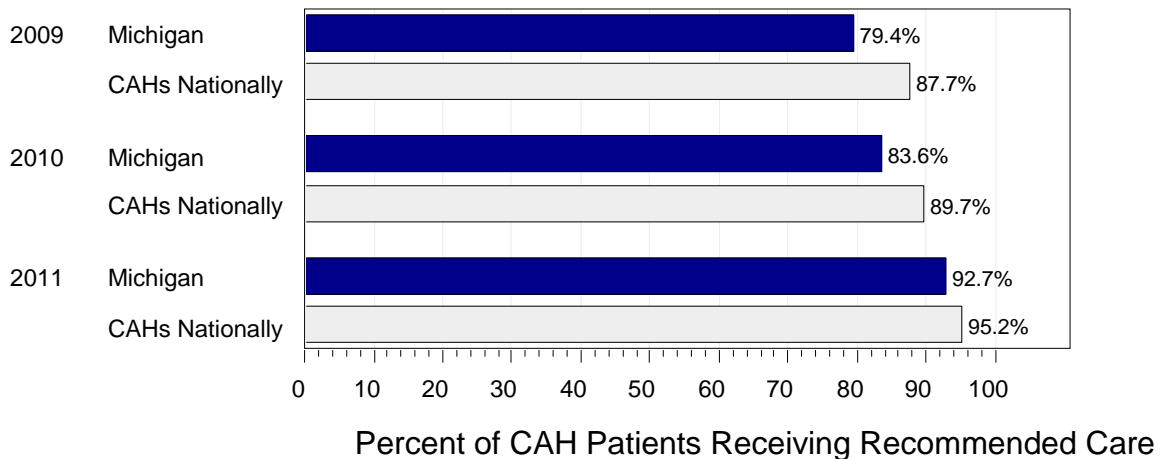


Figure 18. Surgical Care Improvement: Recv'd Blood Clot Prevention Treatments 24 Hrs. Pre/Post Surgery



Appendix B: Three Year Trends in Inpatient and Outpatient Measures

Figure 19. Surgical Care Improvement: Appropriate Hair Removal

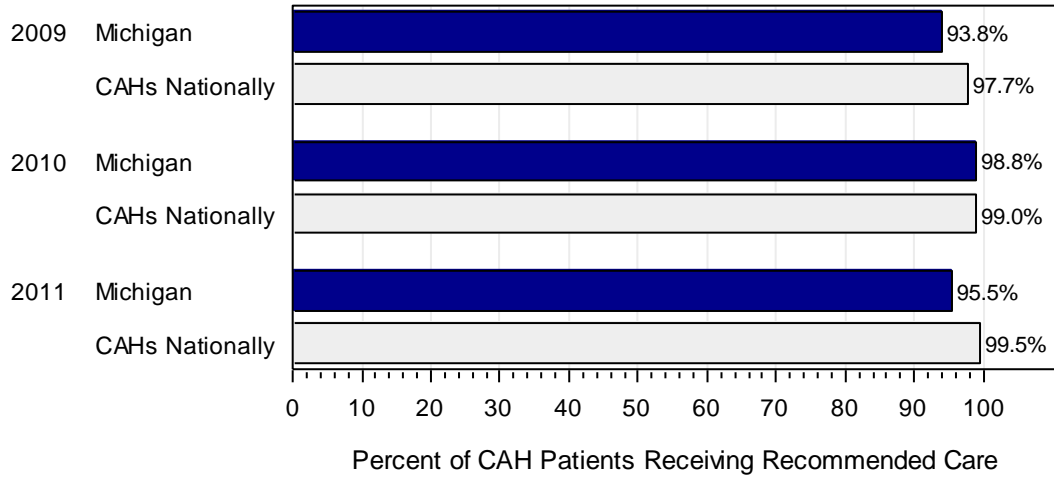


Figure 20. Surgical Care Improvement: Patient on Beta Blockers Prior to Hospitalization and Pre/Post Surgery

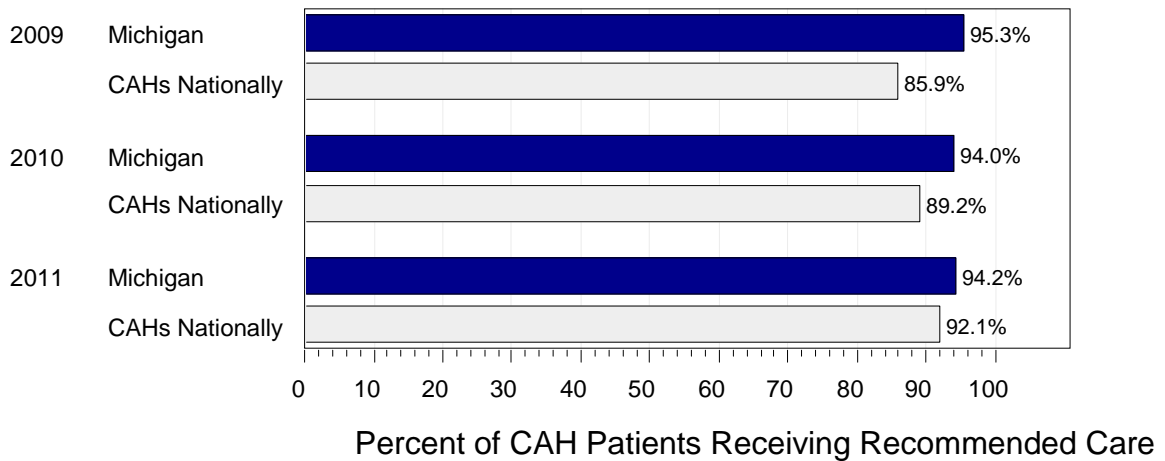
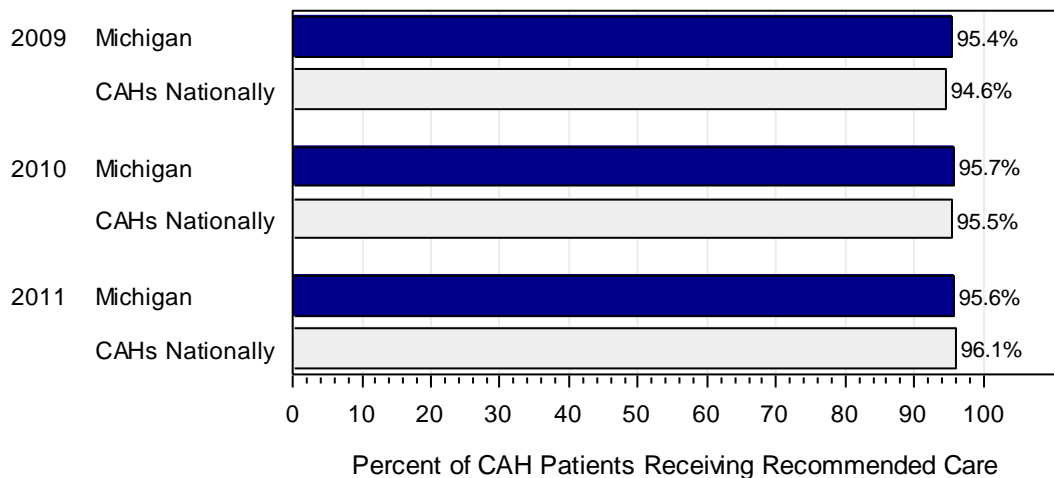


Figure 21. AMI/Chest Pain: Outpatient-Aspirin at Arrival



Appendix B: Three Year Trends in Inpatient and Outpatient Measures

Figure 22. Outpatient Surgery: Preventative Antibiotic(s) One Hour before Incision

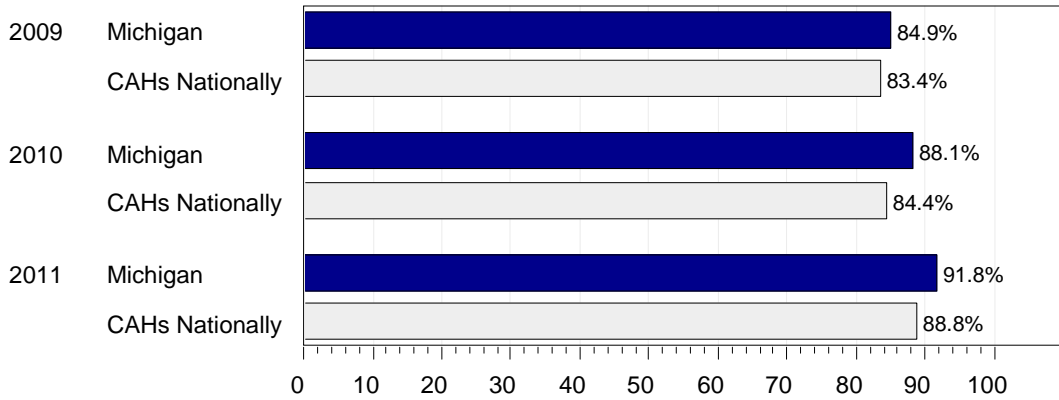
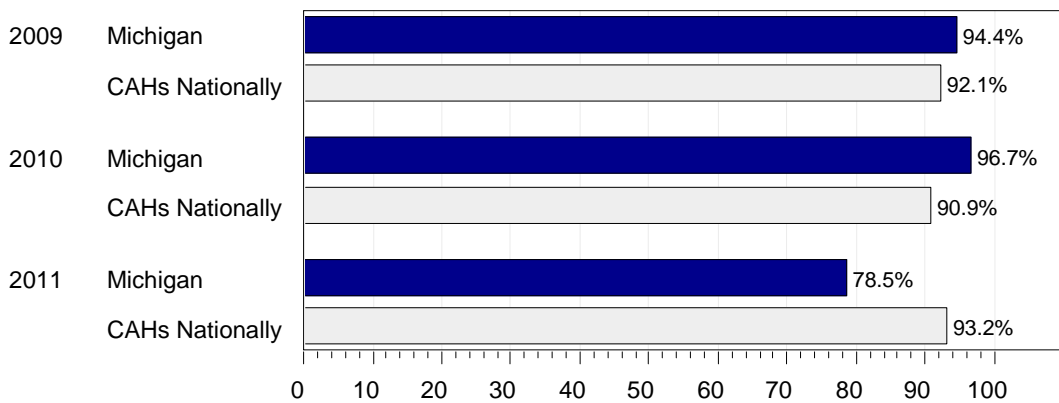


Figure 23. Outpatient Surgery: Received Appropriate Preventative Antibiotic(s)



Percent of CAH Patients Receiving Recommended Care

Appendix C: Michigan Critical Access Hospitals Reporting Inpatient, Outpatient, and HCAHPS Data with At Least One Patient

Inpatient	Hospital City
ALLEGAN GENERAL HOSPITAL	ALLEGAN
ASPIRUS GRAND VIEW HOSPITAL	IRONWOOD
ASPIRUS KEWEENAW HOSPITAL	LAURIUM
BARAGA COUNTY MEMORIAL HOSPITAL	L' ANSE
BELL MEMORIAL HOSPITAL	ISHPEMING
BORGESS-LEE MEMORIAL HOSPITAL	DOWAGIAC
BRONSON LAKEVIEW HOSPITAL	PAW PAW
CARO COMMUNITY HOSPITAL	CARO
CHARLEVOIX AREA HOSPITAL	CHARLEVOIX
CLINTON MEMORIAL HOSPITAL	SAINT JOHNS
DECKERVILLE COMMUNITY HOSPITAL	DECKERVILLE
EATON RAPIDS MEDICAL CENTER	EATON RAPIDS
HAYES GREEN BEACH MEMORIAL HOSPITAL	CHARLOTTE
HELEN NEWBERRY JOY HOSPITAL	NEWBERRY
HERRICK MEMORIAL HOSPITAL	TECUMSEH
HILLS & DALES GENERAL HOSPITAL	CASS CITY
IONIA COUNTY MEMORIAL HOSPITAL	IONIA
MACKINAC STRAITS HOSPITAL AND HEALTH CENTER	SAINT IGNACE
MARLETTE REGIONAL HOSPITAL	MARLETTE
MCKENZIE MEMORIAL HOSPITAL	SANDUSKY
MERCY HEALTH PARTNERS, LAKESHORE CAMPUS	SHELBY
MIDMICHIGAN MEDICAL CENTER-GLADWIN	GLADWIN
NORTHSTAR HEALTH SYSTEM	IRON RIVER
SAINT MARY'S STANDISH COMMUNITY HOSPITAL	STANDISH
SCHEURER HOSPITAL	PIGEON
SCHOOLCRAFT MEMORIAL HOSPITAL	MANISTIQUE
SHERIDAN COMMUNITY HOSPITAL	SHERIDAN
SPECTRUM HEALTH - REED CITY CAMPUS	REED CITY
SPECTRUM HEALTH UNITED MEMORIAL - KELSEY CAMPUS	LAKEVIEW
WEST SHORE MEDICAL CENTER	MANISTEE

Outpatient	Hospital City
EATON RAPIDS MEDICAL CENTER	EATON RAPIDS
HAYES GREEN BEACH MEMORIAL HOSPITAL	CHARLOTTE
HERRICK MEMORIAL HOSPITAL	TECUMSEH
HILLS & DALES GENERAL HOSPITAL	CASS CITY
MARLETTE REGIONAL HOSPITAL	MARLETTE
MCKENZIE MEMORIAL HOSPITAL	SANDUSKY
MIDMICHIGAN MEDICAL CENTER-GLADWIN	GLADWIN
SAINT MARY'S STANDISH COMMUNITY HOSPITAL	STANDISH

Appendix C: Michigan Critical Access Hospitals Reporting Inpatient, Outpatient, and HCAHPS Data with At Least One Patient

Outpatient	Hospital City
SCHEURER HOSPITAL	PIGEON
SPECTRUM HEALTH - REED CITY CAMPUS	REED CITY
SPECTRUM HEALTH UNITED MEMORIAL - KELSEY CAMPUS	LAKEVIEW
WEST SHORE MEDICAL CENTER	MANISTEE

HCAHPS	Hospital City
ALLEGAN GENERAL HOSPITAL	ALLEGAN
BARAGA COUNTY MEMORIAL HOSPITAL	L' ANSE
BORGESS-LEE MEMORIAL HOSPITAL	DOWAGIAC
BRONSON LAKEVIEW HOSPITAL	PAW PAW
CARO COMMUNITY HOSPITAL	CARO
CLINTON MEMORIAL HOSPITAL	SAINT JOHNS
DECKERVILLE COMMUNITY HOSPITAL	DECKERVILLE
HARBOR BEACH COMMUNITY HOSPITAL	HARBOR BEACH
HAYES GREEN BEACH MEMORIAL HOSPITAL	CHARLOTTE
HERRICK MEMORIAL HOSPITAL	TECUMSEH
HILLS & DALES GENERAL HOSPITAL	CASS CITY
IONIA COUNTY MEMORIAL HOSPITAL	IONIA
MCKENZIE MEMORIAL HOSPITAL	SANDUSKY
MIDMICHIGAN MEDICAL CENTER-GLADWIN	GLADWIN
SCHEURER HOSPITAL	PIGEON
SHERIDAN COMMUNITY HOSPITAL	SHERIDAN
SPECTRUM HEALTH - REED CITY CAMPUS	REED CITY
SPECTRUM HEALTH UNITED MEMORIAL - KELSEY CAMPUS	LAKEVIEW
WEST SHORE MEDICAL CENTER	MANISTEE