

Supplementary Appendix Table A1. Summary of quality measures for Medicare Shared Savings Program (MSSP) Accountable Care Organizations (ACOs)

Domain	2014	2015	2016	Domain in Table 3	Specification
Quality Measurement					
Patient/Caregiver Experience					
ACO #1 Getting Timely Care, Appointments, and Information	Yes	Yes	Yes	CAHPS: Patients' Rating of Provider	
ACO #2 How Well Your Doctors Communicate	Yes	Yes	Yes	CAHPS: Patients' Rating of Provider	
ACO #3 Patients' Rating of Doctor	Yes	Yes	Yes	CAHPS: Patients' Rating of Provider	
ACO #4 Access to Specialists	Yes	Yes	Yes	CAHPS: Patients' Rating of Provider	
ACO #5 Health Promotion and Education	Yes	Yes	Yes	CAHPS: Patients' Rating of Provider	
ACO #6 Shared Decision Making	Yes	Yes	Yes	CAHPS: Patients' Rating of Provider	
ACO #7 Health Status/Functional Status	Yes	Yes	Yes		Not specific to the three study conditions
ACO #34 Stewardship of Patient Resources	No	Yes	Yes		Measure changed over time
Care Coordination/Patient Safety					
ACO #8 Risk Standardized, All Condition Readmissions	Yes	Yes	Yes	Risk Standardized, All Condition Readmissions	
ACO #9 ASC Admissions: COPD or Asthma in Older Adults	Yes	Yes	Yes		Summary measure was chosen
ACO #10 ASC Admissions: Heart Failure	Yes	Yes	Yes		Summary measure was chosen
ACO #11 Percent of PCPs who Qualified for EHR Incentive Payment	Yes	Yes	Yes		Not specific to the three study conditions
ACO #12 Medication Reconciliation	Yes	No	No		Measure changed over time
ACO #13 Falls: Screening for Fall Risk	Yes	Yes	Yes	Preventive Care	

Supplementary Appendix Table A1. Continued

Domain	2014	2015	2016	Domain in Table 3	Specification
Quality Measurement					
Care Coordination/Patient Safety					
ACO #35 Skilled Nursing Facility 30-Day All-Cause Readmission Measure (SNFRM)	No	Yes	Yes		Measure changed over time
ACO #36 All-Cause Unplanned Admissions for Patients with Diabetes	No	Yes	Yes		
ACO #37 All-Cause Unplanned Admissions for Patients with Heart Failure	No	Yes	Yes		
ACO #38 All-Cause Unplanned Admissions for Patients with Multiple Chronic Conditions	No	Yes	Yes		
ACO #39 Documentation of Current Medications in the Medical Record	No	Yes	Yes		
Preventive Health					
ACO #14 Influenza Immunization	Yes	Yes	Yes	Preventive Care	
ACO #15 Pneumococcal Vaccination	Yes	Yes	Yes	Preventive Care	
ACO #16 Adult Weight Screening and Follow-up	Yes	Yes	Yes		Not specific to the three study conditions
ACO #17 Tobacco Use Assessment and Cessation Intervention	Yes	Yes	Yes	Preventive Care	
ACO #18 Depression Screening	Yes	Yes	Yes	Preventive Care	
ACO #19 Colorectal Cancer Screening	Yes	Yes	Yes	Preventive Care	
ACO #20 Mammography Screening	Yes	Yes	Yes	Preventive Care	
ACO #21 Proportion of Adults who had blood pressure screened in past 2 years	Yes	Yes	Yes		Summary measure was chosen
ACO #42 Statin Therapy for the Prevention and Treatment of Cardiovascular Disease	No	No	Yes		Measure changed over time

Supplementary Appendix Table A1. Continued

Domain	2014	2015	2016	Domain in Table 3	Specification
Quality Measurement					
Clinical Care for At-Risk Population: Diabetes					
ACO #22 Hemoglobin A1c Control (HbA1c) <8 percent	Yes	No	No		Measure changed over time
ACO #23 Low Density Lipoprotein (LDL) <100mg/dL	Yes	No	No		
ACO #24 Blood Pressure (BP) <140/90	Yes	No	No		
ACO #25 Tobacco Non Use	Yes	No	No		
ACO #26 Aspirin Use	Yes	No	No		
ACO #27 Percent of beneficiaries with diabetes whose HbA1c in poor control (>9 percent)	Yes	Yes	Yes	Chronic disease management	
ACO #40 Depression Remission at Twelve Months	No	Yes	Yes		Measure changed over time
ACO #41 Diabetes--Eye Exam	No	Yes	Yes		
Clinical Care for At-Risk Population: Hypertension					
ACO #28 Percent of beneficiaries with hypertension whose BP<140/90	Yes	Yes	Yes	Chronic disease management	
Clinical Care for At-Risk Population: IVD					
ACO #29 Percent of beneficiaries with IVD with complete lipid profile and LDL control <100mg/dl	Yes	No	No		Measure changed over time
ACO #30 Percent of beneficiaries with IVD who use Aspirin or other antithrombotic	Yes	Yes	Yes	Medication Management	
Clinical Care for At-Risk Population: HF					
ACO #31 Beta-Blocker Therapy for LVSD	Yes	Yes	Yes	Medication Management	
Clinical Care for At-Risk Population: CAD					
ACO #32 Drug Therapy for Lowering LDL Cholesterol	Yes	No	No		Measure changed over time
ACO #33 ACE Inhibitor or ARB Therapy for Patients with CAD and Diabetes and/or LVSD	Yes	Yes	Yes	Medication Management	

Supplementary Appendix Table A2. Quality of care of Accountable Care Organizations (ACOs) by tertile of nurse practitioner (NP) involvement

ACO quality of care measure	T1	T2	T3	p value [†]
	Mean ± STD (Median)			
Patient and Caregiver Experience				
Getting Timely Care, Appointments, and Information	79.5 ± 3.8 (80.0)	80.0 ± 3.7 (80.0)	80.6 ± 3.7 (80.8)	0.0035
How Well Your Doctors Communicate	92.2 ± 2.0 (92.6)	92.5 ± 1.5 (92.8)	92.7 ± 1.9 (93.0)	0.0013
Patients' Rating of Doctor	91.4 ± 2.0 (91.8)	91.9 ± 1.6 (92.1)	92.0 ± 1.7 (92.2)	0.0015
Access to Specialists	83.5 ± 2.6 (83.7)	83.6 ± 2.3 (83.6)	83.8 ± 2.5 (84.1)	0.2102
Health Promotion and Education	59.3 ± 3.9 (59.5)	59.0 ± 3.9 (59.0)	59.2 ± 3.8 (59.2)	0.6403
Shared Decision Making	74.8 ± 2.6 (75.0)	74.8 ± 2.5 (74.9)	75.1 ± 2.7 (75.3)	0.1229
Risk Standardized, All Condition Readmission	15.0 ± 0.8 (15.0)	14.9 ± 0.7 (14.8)	14.7 ± 0.7 (14.7)	<.0001
Preventive Care				
Falls: Screening for Fall Risk	54.1 ± 22.7 (55.9)	53.9 ± 22.6 (54.4)	60.8 ± 21.8 (63.6)	0.0010
Influenza Immunization	60.9 ± 17.1 (62.1)	63.2 ± 14.5 (65.0)	65.4 ± 11.9 (65.9)	0.0015
Pneumococcal Vaccination	56.4 ± 19.5 (59.1)	63.2 ± 17.6 (65.8)	70.3 ± 15.0 (72.3)	<.0001
Tobacco Use Assessment and Cessation Intervention	87.8 ± 12.9 (92.2)	89.5 ± 11.7 (92.9)	91.5 ± 7.7 (93.5)	0.0001
Depression Screening	47.4 ± 23.0 (47.7)	44.4 ± 23.3 (44.5)	48.4 ± 22.7 (48.8)	0.5960
Colorectal Cancer Screening	56.6 ± 15.2 (58.1)	59.5 ± 14.3 (61.2)	62.3 ± 12.4 (63.8)	<.0001
Mammography Screening	62.4 ± 14.5 (63.0)	64.2 ± 13.5 (65.1)	68.7 ± 11.3 (69.7)	<.0001
Chronic disease management				
Percent of beneficiaries with diabetes whose HbA1c in poor control (>9 percent)	22.4 ± 13.8 (19.1)	19.0 ± 10.4 (17.1)	17.5 ± 8.5 (15.5)	<.0001
Percent of beneficiaries with hypertension whose BP<140/90	69.1 ± 10.1 (70.3)	69.6 ± 9.1 (70.2)	69.8 ± 6.7 (70.2)	0.3555

ACO quality of care measure	T1	T2	T3	p value [†]
Medication management				
Percent of beneficiaries with IVD who use Aspirin or other antithrombotic	79.6 ± 15.6 (83.3)	84.0 ± 11.6 (86.3)	86.6 ± 8.4 (88.3)	<.0001
Beta-Blocker Therapy for LVSD	85.3 ± 16.5 (90.0)	87.5 ± 11.0 (90.0)	88.0 ± 10.5 (89.7)	0.0164
ACE Inhibitor or ARB Therapy for Patients with CAD and Diabetes and/or LVSD	76.2 ± 14.2 (78.5)	77.6 ± 10.5 (78.9)	79.4 ± 9.2 (80.3)	0.0016

[†]The association between NP involvement tertile and each ACO characteristic was analyzed using the generalized estimating equations models adjusted for year with multinomial distribution and cumulative logit link function. HbA1c, hemoglobin A1c; BP, blood pressure; IVD, intravascular disease; LVSD, left ventricular systolic dysfunction; ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; CAD, coronary artery disease

Supplementary Appendix Table A3. Taxonomy codes for nurse practitioners (NPs) in primary care

Taxonomy code	Description
363L00000X	Nurse Practitioner
363LA2200X	NP-Adult Health
363LF0000X	NP-Family
363LG0600X	NP-Gerontology
363LP2300X	NP-Primary Care
363LW0102X	NP-Women's Health

Supplementary Appendix Table A4. Current Procedural Terminology (CPT) codes for evaluation and management services

CPT	CPT description
98960 - 98962	Education and Training for Patient Self-Management
98966 - 98969	Non-Face-to-Face Nonphysician Services
99078	Physician or other qualified health care professional educational services rendered to patients in a group setting
99091 - 99457	Non-Face-to-Face Physician Services
99201 - 99215	Office or Other Outpatient Services
99217 - 99226	Hospital Observation Services
99221 - 99239	Hospital Inpatient Services
99241 - 99255	Consultations
99281 - 99288	Emergency Department Services
99291 - 99292	Critical Care Services
99304 - 99318	Nursing Facility Services
99324 - 99337	Domiciliary, Rest Home (eg, Boarding Home), or Custodial Care Services
99339 - 99340	Domiciliary, Rest Home (eg, Assisted Living Facility), or Home Care Plan Oversight Services
99341 - 99350	Home Services
99354 - 99416	Prolonged Services
99366 - 99368	Case Management Services
99374 - 99380	Care Plan Oversight Services
99381 - 99429	Preventive Medicine Services
99450 - 99456	Special Evaluation and Management Services
99460 - 99463	Newborn Care Services
99464 - 99465	Delivery/Birthing Room Attendance and Resuscitation Services
99466 - 99486	Inpatient Neonatal Intensive Care Services and Pediatric and Neonatal Critical Care Services
99483 - 99483	Cognitive Assessment and Care Plan Services
99484 - 99484	General Behavioral Health Integration Care Management
99487 - 99491	Care Management Services
99492 - 99494	Psychiatric Collaborative Care Management Services
99495 - 99496	Transitional Care Management Services
99497 - 99498	Advanced Care Planning
99499 - 99499	Other Evaluation and Management Services

Supplementary Appendix Table A5. Influence of nurse practitioner (NP) involvement on characteristics of quality of care for Accountable Care Organizations (ACOs)

Variable	Patient and Caregiver Experience	Risk Standardized, All Condition Readmission	Preventive Care	Chronic disease management	Medication management
			Beta (SE)		
NP Involvement					
T3	reference	reference	reference	reference	reference
T2	-0.07 (0.138)	0.16 (0.056)*	-2.38 (0.805)*	-1.07 (0.591)	-0.85 (0.849)
T1	0.14 (0.194)	0.15 (0.070)*	-1.51 (1.134)	-1.23 (0.849)	-1.71 (1.109)
ACO Size					
≤ 10,000 beneficiaries	reference	reference	reference	reference	reference
10,001-20,000 beneficiaries	-0.16 (0.144)	0.08 (0.056)	-0.03 (0.888)	0.77 (0.648)	0.85 (0.825)
> 20,000 beneficiaries	0.26 (0.170)	0.07 (0.068)	0.79 (1.165)	0.66 (0.663)	0.92 (0.856)
Participate in Advance Payment Model					
No	reference	reference	reference	reference	reference
Yes	0.45 (0.254)	0.07 (0.080)	2.70 (2.386)	2.40 (1.045)*	0.81 (1.683)
Number of years in MSSP	0.16 (0.043)*	-0.08 (0.017)*	4.20 (0.284)*	1.36 (0.215)*	1.56 (0.266)*
Primary care MD PCE per 10,000 beneficiaries	0.01 (0.005)	-0.0004 (0.002)	-0.02 (0.031)	0.02 (0.020)	-0.01 (0.022)
Primary care PA PCE per 10,000 beneficiaries	-0.15 (0.143)	0.05 (0.061)	-0.08 (0.855)	-0.41 (0.694)	-0.35 (0.633)
Specialist [§] PCE per 10,000 beneficiaries	0.03 (0.016)*	0.01 (0.006)*	0.26 (0.093)*	0.08 (0.064)	0.18 (0.091)
Average age of beneficiaries	0.05 (0.125)	0.11 (0.042)*	2.03 (0.757)*	0.81 (0.491)	-0.05 (0.719)
% Male	-0.15 (0.037)*	0.02 (0.011)*	-0.49 (0.195)*	-0.14 (0.170)	-0.10 (0.177)
% Dual eligible	-0.0001 (0.010)	-0.002 (0.003)	0.03 (0.058)	0.03 (0.036)	-0.08 (0.069)
% Minority	-0.04 (0.009)*	-0.001 (0.003)	-0.15 (0.054)*	-0.16 (0.032)*	-0.07 (0.051)
% DM	0.02 (0.019)	0.02 (0.007)*	-0.05 (0.121)	0.17 (0.079)*	0.01 (0.092)
% HF	-0.04 (0.034)	0.03 (0.011)*	-0.97 (0.198)*	-0.58 (0.142)*	-0.28 (0.180)
% COPD	-0.004 (0.023)	-0.001 (0.008)	0.34 (0.152)*	0.03 (0.101)	0.17 (0.142)
Total number of ESRD/disabled person-years per 1,000 person-years	-0.0005 (0.004)	0.005 (0.001)*	0.04 (0.024)	-0.004 (0.016)	0.01 (0.026)

*P-value < 0.05; NP, nurse practitioner; ACO, accountable care organization; MSSP, Medicare Shared Savings Program; MD, doctor of medicine; PCE, proportion of clinical effort; PA, physician assistant; DM, diabetes mellitus; HF, heart failure; COPD, chronic obstructive pulmonary disease, ESRD, end stage renal disease.