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## Cost-effectiveness of Enhanced Depression Care after Acute Coronary Syndrome: Results from the COPES Randomized Controlled Trial

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### To the Editor

Depression following an acute coronary syndrome (ACS) affects 2 in 5 patients and is one of the most important psychosocial predictors of a poor cardiovascular prognosis.<sup>1</sup> In the Coronary Psychosocial Evaluation Studies (COPES) randomized controlled trial, we compared the effectiveness of enhanced depression care, which comprised patient preference for problem-solving psychotherapy, antidepressant use, or both, through the use of a stepped-care algorithm, to usual care in patients with ACS and persistent depressive symptoms 3 months after discharge.<sup>2</sup> The 6-month trial demonstrated that enhanced depression care improved patient satisfaction with treatment and reduced depressive symptoms. However, the intervention's impact on health-related quality of life, healthcare utilization, and cost-effectiveness has not been evaluated. To help bridge this gap and inform decision-making, we undertook a cost-effectiveness analysis of enhanced depression treatment in patients with ACS and persistent depressive symptoms using results from the COPES trial.

### Methods

#### Data

We interviewed patients to determine their antidepressant and anxiolytic medication use and dose; ambulatory care visits with mental health specialists, cardiologists, and primary care physicians; and hospitalizations for stable angina, unstable angina, ST-segment elevation or non-ST-segment elevation myocardial infarction, and congestive heart failure. Hospitalizations were confirmed by medical chart review and adjudicated by two board-certified cardiologists. Hospital electronic health records were also actively surveyed for hospitalizations. Costs were estimated using average wholesale drug prices and Medicare reimbursement rates. Standardized measures of quality of life were obtained using the Short-Form-12 (SF-12) Health Survey and converted to health utilities using the SF-6D scoring algorithm.<sup>3</sup>

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## Statistical and cost analysis

Quality of life, healthcare utilization, and cost outcomes were adjusted for potential confounding by age, gender, ethnicity, race, marital status, education, depressive symptom severity, type of ACS, and left ventricular ejection fraction using linear regression models. To determine cost-effectiveness, mean incremental costs and mean incremental quality-adjusted life-years (QALYs) were estimated using 6-month outcomes. We performed nonparametric bootstrapping with 1,000 random samples to estimate confidence intervals for cost-effectiveness ratios.<sup>4</sup>

## Results

### Quality of life outcomes

The mean age of the study population was 60 years (SD=10.6) and 53% were female, 49% were Hispanic, and 19% were African American. At 6-month follow-up, there was a trend toward greater improvements in health utility in the intervention group compared to the usual care group (0.60 vs. 0.56,  $p=0.07$ ).

### Ambulatory care utilization

Among patients randomized to receive enhanced depression care, 51% reported using antidepressants or anxiolytics compared with 30% of patients receiving usual care, with mean costs of \$261 compared to \$236 (adjusted difference=\$18,  $p=0.81$ ) (Table). Utilization of mental health care was also more frequent in the intervention arm, with 75% visiting a mental health specialist at least once, compared to 35% in usual care arm (mean cost \$585 vs. \$58; adjusted difference=\$535,  $p<0.01$ ). The frequency of visits to cardiologists and primary care physicians was similar in the intervention and control groups, with 88% and 92% of patients reporting at least one cardiology appointment, and 95% and 92% of patients reporting at least one primary care appointment, respectively. Mean total costs for ambulatory care in the intervention group were \$1,083 compared to \$554 in the usual care group (adjusted difference=\$536,  $p<0.01$ ).

### Hospital care utilization

The higher costs of mental health care and higher utilization of psychotropic medication in the intervention group were offset by savings in hospitalizations for major adverse cardiac events and heart failure. Overall, 5% of patients receiving enhanced depression care compared to 16% of patients receiving usual care were hospitalized for stable angina, unstable angina, ST-segment elevation or non-ST-segment elevation myocardial infarction, or heart failure. This difference in hospitalization rates resulted in a cost difference of –\$1,782 (95% CI –\$3,163 to –\$402,  $p=0.01$ ).

### Cost-effectiveness

Mean total healthcare costs, including costs for psychotropic medications, ambulatory care, and hospitalizations, totaled \$1,857 for the enhanced depression care group and \$2,797 for the usual care group (adjusted difference=–\$1,229 per patient, 95% CI –\$2,652 to \$195,  $p=0.09$ ). Because the intervention was cost-saving on average, no mean cost-effectiveness ratio exists. Bootstrap analysis demonstrated that, if society is willing to pay \$30,000 per-QALY gained by enhanced depression care, the probability that this treatment approach will be considered cost-effective is 98%.

## Comments

To our knowledge, this analysis is the first economic evaluation of enhanced depression treatment in patients with ACS and persistent depressive symptoms. A growing body of evidence suggests that mental health problems complicate physical health conditions, and that this relationship worsens clinical outcomes,<sup>1</sup> increases hospitalizations,<sup>5</sup> and adversely affects quality of life.<sup>6,7</sup> Another recent study of patients with depression and poorly controlled diabetes mellitus or coronary heart disease found that a multi-component treatment program, with particular emphasis on depressive symptoms, reduced healthcare costs.<sup>8</sup> The findings from our study support this conclusion, while highlighting the need for larger studies with longer follow-up to examine the robustness and durability of these findings.

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Table

Healthcare utilization and costs over 6 months (adjusted differences between control and intervention group)

Characteristic	Usual care (n=77)		Intervention (n=80)		Difference	95% CI	P value
	Patients with use, %	Cost, \$	Patients with use, %	Cost, \$			
<b>Medications</b>							
Antidepressant	26	179	46	245	53	-70 to 175	0.4
Anxiolytic	12	57	18	16	-35	-111 to 41	0.37
Any psychotropic medication	30	236	51	261	18	-129 to 165	0.81
<b>Ambulatory visits</b>							
Mental health	35	58	75	585	535	411 to 659	<.01
Primary care	95	241	92	210	-33	-67 to 1	0.06
Cardiology	88	256	92	289	34	-12 to 79	0.14
Any ambulatory care	100	554	100	1,083	536	405 to 667	<.01
<b>Hospital admissions</b>							
STEMI	0	-	1	134	124	-159 to 406	0.39
NSTEMI or unstable angina	13	1,657	3	245	-1,606	-2,732 to -480	<.01
Stable angina	1	29	1	56	7	-124 to 137	0.92
Heart failure	3	321	1	77	-306	-823 to 211	0.25
Any cardiac hospitalization	16	2,007	5	513	-1,782	-3,163 to -402	0.01
<b>Total cost</b>		<b>2,797</b>		<b>1,857</b>	<b>-1,229</b>	<b>-2,652 to 195</b>	<b>0.09</b>

Abbreviations: STEMI=ST-segment elevation myocardial infarction; NSTEMI = non-STEMI