

Supplemental online content for:

Nonadherence to Statins and Antihypertensives and Hospitalizations Among Elderly Medicare Beneficiaries With Incident Cancer

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| eAppendix 1. Multinomial Logistic Regression Models Used to Derive IPTW | | | | | | | | | | | | | |
|---|--------------------------|------------|------------------|--|----------------------------|------------|------------------|-----------------------|------------|------------------|--------------------------|------------|------------------|
| Characteristics | No ADH 2 Rx ^a | | | | ADH 1 of 2 Rx ^b | | | ADH 1 Rx ^c | | | No ADH 1 Rx ^d | | |
| | AOR | 95% CI | Sig ^e | | AOR | 95% CI | Sig ^e | AOR | 95% CI | Sig ^e | AOR | 95% CI | Sig ^e |
| Age, y | | | | | | | | | | | | | |
| 68–70 | 0.65 | 0.54, 0.79 | *** | | 0.99 | 0.85, 1.16 | | 0.71 | 0.60, 0.84 | *** | 0.75 | 0.63, 0.90 | ** |
| 71–74 | 0.79 | 0.67, 0.93 | ** | | 1.01 | 0.88, 1.15 | | 0.74 | 0.64, 0.86 | *** | 0.70 | 0.59, 0.82 | *** |
| 75–79 | 0.77 | 0.66, 0.90 | ** | | 1.01 | 0.89, 1.16 | | 0.81 | 0.70, 0.93 | ** | 0.72 | 0.61, 0.84 | *** |
| ≥80 | Ref ^f | | | | | | | | | | | | |
| Race/Ethnicity | | | | | | | | | | | | | |
| African American | 1.88 | 1.52, 2.32 | *** | | 1.17 | 0.96, 1.43 | | 1.42 | 1.16, 1.74 | *** | 1.90 | 1.54, 2.35 | *** |
| Other | 1.47 | 1.20, 1.80 | *** | | 1.17 | 0.98, 1.39 | | 1.07 | 0.88, 1.30 | | 1.12 | 0.90, 1.38 | |
| White | Ref ^f | | | | | | | | | | | | |
| Medicare Part D coverage | | | | | | | | | | | | | |
| Exceeded | 2.93 | 1.96, 4.38 | *** | | 1.51 | 1.14, 1.99 | ** | 2.14 | 1.52, 3.01 | *** | 3.61 | 2.33, 5.60 | *** |
| Not reached | 1.10 | 0.66, 1.83 | | | 0.92 | 0.65, 1.32 | | 1.09 | 0.71, 1.68 | | 1.13 | 0.65, 1.96 | |
| Reached | Ref ^f | | | | | | | | | | | | |
| Cancer diagnosis categories | | | | | | | | | | | | | |
| Women with breast cancer | 0.86 | 0.71, 1.04 | | | 1.08 | 0.92, 1.25 | | 1.54 | 1.31, 1.81 | *** | 1.33 | 1.11, 1.60 | ** |
| Women with colorectal cancer | 2.28 | 1.84, 2.82 | *** | | 1.71 | 1.42, 2.07 | *** | 1.55 | 1.26, 1.92 | *** | 2.76 | 2.22, 3.43 | *** |
| Men with colorectal cancer | 2.31 | 1.88, 2.84 | *** | | 1.29 | 1.07, 1.56 | ** | 1.11 | 0.89, 1.39 | | 2.37 | 1.90, 2.95 | *** |
| Men with prostate cancer | Ref ^f | | | | | | | | | | | | |
| Cancer stage | | | | | | | | | | | | | |
| 0/I | 0.61 | 0.50, 0.74 | *** | | 0.89 | 0.75, 1.05 | | 0.80 | 0.67, 0.97 | * | 0.67 | 0.55, 0.82 | *** |
| II | 0.76 | 0.64, 0.90 | ** | | 0.91 | 0.78, 1.07 | | 0.87 | 0.74, 1.04 | | 0.91 | 0.76, 1.09 | |
| III/IV | Ref ^f | | | | | | | | | | | | |
| Cancer treatment | | | | | | | | | | | | | |
| Cardiotoxic | 1.00 | 0.83, 1.21 | | | 0.97 | 0.83, 1.13 | | 0.89 | 0.75, 1.05 | | 0.98 | 0.82, 1.19 | |
| None | 1.17 | 0.98, 1.39 | | | 0.92 | 0.80, 1.07 | | 0.98 | 0.84, 1.14 | | 1.01 | 0.84, 1.20 | |
| Non-cardiotoxic | Ref ^f | | | | | | | | | | | | |
| Discordant PHC ^g | | | | | | | | | | | | | |
| Yes | 1.29 | 1.14, 1.47 | *** | | 1.15 | 1.04, 1.28 | ** | 1.34 | 1.20, 1.50 | *** | 1.57 | 1.39, 1.79 | *** |
| No | Ref ^f | | | | | | | | | | | | |
| Concordant PHC ^g | | | | | | | | | | | | | |
| Yes | 0.66 | 0.49, 0.90 | ** | | 0.84 | 0.65, 1.10 | | 0.49 | 0.38, 0.63 | *** | 0.32 | 0.25, 0.41 | *** |
| No | Ref ^f | | | | | | | | | | | | |
| Mental health conditions ^h | | | | | | | | | | | | | |
| Yes | 1.60 | 1.36, 1.89 | *** | | 1.16 | 0.99, 1.34 | | 1.20 | 1.02, 1.41 | * | 1.77 | 1.50, 2.09 | *** |
| No | Ref ^f | | | | | | | | | | | | |
| Tobacco use | | | | | | | | | | | | | |
| Yes | 1.39 | 1.04, 1.85 | * | | 1.16 | 0.90, 1.51 | | 0.98 | 0.73, 1.31 | | 1.12 | 0.83, 1.52 | |
| No | Ref ^f | | | | | | | | | | | | |
| Alcohol use | | | | | | | | | | | | | |
| Yes | 1.22 | 0.67, 2.20 | | | 0.99 | 0.58, 1.71 | | 1.35 | 0.78, 2.34 | | 2.53 | 1.53, 4.19 | *** |
| No | Ref ^f | | | | | | | | | | | | |
| Primary care visit | | | | | | | | | | | | | |
| Yes | 1.34 | 1.11, 1.61 | ** | | 1.14 | 0.99, 1.32 | | 1.00 | 0.87, 1.17 | | 1.05 | 0.88, 1.24 | |
| No | Ref ^f | | | | | | | | | | | | |
| Cardiologist visit | | | | | | | | | | | | | |
| Yes | 1.03 | 0.90, 1.18 | | | 1.08 | 0.97, 1.21 | | 0.65 | 0.58, 0.73 | *** | 0.73 | 0.64, 0.83 | *** |
| No | Ref ^f | | | | | | | | | | | | |
| CAD severity | | | | | | | | | | | | | |
| Yes | 1.15 | 0.85, 1.56 | | | 0.98 | 0.75, 1.27 | | 0.61 | 0.46, 0.83 | ** | 0.69 | 0.50, 0.96 | * |
| No | Ref ^f | | | | | | | | | | | | |
| SEER region | | | | | | | | | | | | | |
| Northeast | 1.04 | 0.88, 1.22 | | | 1.07 | 0.94, 1.22 | | 1.15 | 1.00, 1.33 | * | 0.92 | 0.78, 1.08 | |
| South | 1.24 | 1.06, 1.46 | ** | | 1.17 | 1.02, 1.33 | * | 1.05 | 0.91, 1.22 | | 1.10 | 0.94, 1.29 | |
| North-Central | 0.92 | 0.76, 1.11 | | | 1.01 | 0.87, 1.18 | | 0.96 | 0.82, 1.14 | | 0.76 | 0.62, 0.92 | ** |
| West | Ref ^f | | | | | | | | | | | | |

Based on 12,096 elderly fee-for-service Medicare beneficiaries with preexisting CAD and incident breast, colorectal, or prostate cancer. Weights were derived using the IPTW approach.

Time-invariant characteristics included cancer diagnosis categories, age, race/ethnicity, concordant and discordant physical health conditions, CAD severity, SMI, and SEER region. Time-variant characteristics included tobacco use, alcohol use, depression, anxiety, routine follow-up with primary care physician and/or cardiologist, and Medicare Part D coverage.

Abbreviations: ACEIs, angiotensin-converting enzyme inhibitors; ADH, adherence; AOR, adjusted odds ratio; ARBs, angiotensin II receptor blockers; CAD, coronary artery disease; IPTW, inverse probability treatment weighting; PHC, physical health conditions; Rx, prescription; Sig, significance; SMI, serious mental illness.

^aNot adherent to both statins and ACEIs/ARBs/β-blockers.

^bAdherent to either statins or ACEIs/ARBs/β-blockers.

^cUse of one medication class and adherent to that class.

^dUse of one medication class and not adherent to that medication class.

^eAsterisks represent significant differences in study population characteristics (time-invariant).

^fReference group is patients adherent to both statins and ACEIs/ARBs/β-blockers.

^gConsisted of arthritis, asthma, chronic obstructive pulmonary disease, osteoporosis, dementia, HIV, and hepatitis.

^hConsisted of diabetes, hyperlipidemia, hypertension, stroke, cardiac arrhythmia, and congestive heart failure.

ⁱIncluded anxiety, depression, and SMI (schizophrenia, bipolar disorder, and psychoses).

*.01≤P<.05; **.001≤P<.01; ***P<.001.

| eAppendix 2. Weighted Percentage With CAD-Related Hospitalizations Over Different Periods | | | | |
|---|-------------------------|--------------------------|-------------------------|-------------------------|
| Use and Adherence to CAD-Related Pharmacotherapy | Pre-Cancer dx Period | Initial Cancer tx Period | Post-tx Period | |
| | t ₀ Wt. % | t ₁ Wt. % | t ₂ Wt. % | t ₃ Wt. % |
| CAD-related hospitalization | | | | |
| ADH 2 Rx ^a | 7.5 | 28.6 | 8.9 | 7.6 |
| No ADH 2 Rx ^b | 10.4 | 31.4 | 18.0 | 14.7 |
| ADH 1 of 2 Rx ^c | 8.5 | 28.1 | 12.6 | 11.2 |
| ADH 1 Rx ^d | 5.7 | 19.9 | 7.3 | 7.1 |
| No ADH 1 Rx ^e | 7.6 | 22.7 | 9.7 | 10.2 |
| Other hospitalization | | | | |
| ADH 2 Rx ^a | 2.1 | 14.2 | 3.5 | 2.6 |
| No ADH 2 Rx ^b | 3.6 | 18.3 | 7.0 | 6.2 |
| ADH 1 of 2 Rx ^c | 2.8 | 17.4 | 3.9 | 4.4 |
| ADH 1 Rx ^d | 3.2 | 22.7 | 5.7 | 4.0 |
| No ADH 1 Rx ^e | 4.3 | 23.8 | 8.0 | 6.3 |

Based on 12,096 elderly fee-for-service Medicare beneficiaries with preexisting CAD and incident breast, colorectal, and prostate cancer diagnosis. Weights were derived using the IPTW approach.

Abbreviations: ACEIs, angiotensin-converting enzyme inhibitors; ADH, adherence; ARBs, angiotensin II receptor blockers; CAD, coronary artery disease; Dx, diagnosis; IPTW, inverse probability treatment weighting; Rx, prescription; Tx, treatment; Wt, weight.

^aAdherent to both statins and ACEIs/ARBs/ β -blockers.

^bNot adherent to both statins and ACEIs/ARBs/ β -blockers.

^cAdherent to either statins or ACEIs/ARBs/ β -blockers.

^dUse of one medication class and adherent to that class.

^eUse of one medication class and not adherent to that medication class.

| eAppendix 3. Sensitivity Analysis: CAD Hospitalization Identified From Primary Diagnosis | | | | | | |
|--|-----------------------------|--------------|------------------|-----------------------|--------------|------------------|
| Medication Adherence Categories | CAD-Related Hospitalization | | | Other Hospitalization | | |
| | OR/AOR ^a | 95% CI | Sig ^b | OR/AOR ^a | 95% CI | Sig ^b |
| Unadjusted GEE analysis | | | | | | |
| No ADH 2 Rx ^c | 2.36 | (2.20, 2.52) | *** | 1.61 | (1.53, 1.70) | *** |
| ADH 1 of 2 Rx ^d | 1.38 | (1.24, 1.52) | *** | 1.24 | (1.17, 1.31) | *** |
| ADH 1 Rx ^e | 0.76 | (0.56, 0.95) | ** | 1.06 | (0.98, 1.13) | |
| No ADH 1 Rx ^f | 1.23 | (1.03, 1.43) | * | 1.39 | (1.31, 1.47) | *** |
| ADH 2 Rx ^g | Ref ^h | | | Ref | | |
| Adjusted GEE analysis | | | | | | |
| No ADH 2 Rx ^c | 2.57 | (2.41, 2.74) | *** | 1.75 | (1.66, 1.84) | *** |
| ADH 1 of 2 Rx ^d | 1.42 | (1.27, 1.57) | *** | 1.27 | (1.20, 1.35) | *** |
| ADH 1 Rx ^e | 0.83 | (0.63, 1.02) | | 1.11 | (1.03, 1.19) | ** |
| No ADH 1 Rx ^f | 1.46 | (1.26, 1.66) | *** | 1.58 | (1.49, 1.67) | *** |
| ADH 2 Rx ^g | Ref | | | Ref | | |

Based on 12,096 elderly fee-for-service Medicare beneficiaries with preexisting CAD and incident breast, colorectal, or prostate cancer diagnosis. Weights were derived using the IPTW approach.

Adjusted model controlled for independent variables. Time-invariant characteristics included cancer diagnosis categories, age, race/ethnicity, poverty status, high school education, concordant and discordant physical health conditions, SMI, SEER region, and county-level characteristics. Time-variant characteristics included tobacco use, alcohol use, depression, anxiety, and routine follow-up with primary care physician and/or cardiologist, and donut hole.

Abbreviations: ACEIs, angiotensin-converting enzyme inhibitors; ADH, adherence; AOR, adjusted odds ratio; ARBs, angiotensin II receptor blockers; CAD, coronary artery disease; GEE, generalized estimating equations; IPTW, inverse probability treatment weighting; OR, odds ratio; Sig, significance; SMI, serious mental illness.

^aORs are reported for unadjusted GEE model and AORs are reported for adjusted GEE model.

^bAsterisks represent significant differences in medication adherence groups, derived from GEE.

^cNot adherent to both statins and ACEIs/ARBs/β-blockers.

^dAdherent to either statins or ACEIs/ARBs/β-blockers.

^eUse of one medication class and adherent to that class.

^fUse of one medication class and not adherent to that medication class.

^gAdherent to both statins and ACEIs/ARBs/β-blockers.

^hReference category for dependent variable is no hospitalization.

*.01 ≤ P < .05; **.001 ≤ P < .01; ***P < .001.

| eAppendix 4. Adjusted GEE Models With IPTW on CAD Hospitalization | | | | | | |
|---|-----------------------------|--------------|------------------|-----------------------|--------------|------------------|
| Characteristics | CAD-Related Hospitalization | | | Other Hospitalization | | |
| | AOR | 95% CI | Sig ^a | AOR | 95% CI | Sig ^a |
| Predisposing Factors | | | | | | |
| Age, y | | | | | | |
| 68–70 | 0.86 | (0.75, 0.96) | ** | 1.34 | (1.22, 1.46) | *** |
| 71–74 | 0.85 | (0.76, 0.94) | *** | 1.08 | (0.97, 1.19) | |
| 75–79 | 0.84 | (0.75, 0.93) | *** | 0.98 | (0.87, 1.08) | |
| ≥80 | Ref ^b | | | | | |
| Race/Ethnicity | | | | | | |
| African American | 1.21 | (1.07, 1.35) | ** | 1.30 | (1.15, 1.45) | *** |
| White | 1.00 | (0.87, 1.12) | | 1.11 | (0.98, 1.24) | |
| Other | Ref ^b | | | | | |
| Enabling Factors | | | | | | |
| Marital status | | | | | | |
| Single | 1.16 | (1.02, 1.29) | * | 1.09 | (0.94, 1.23) | |
| Separated/Divorced/Widowed/Unknown | 1.07 | (0.99, 1.14) | | 0.94 | (0.86, 1.03) | |
| Married | Ref ^b | | | | | |
| Education level | | | | | | |
| < National average, 12% | 0.92 | (0.84, 0.99) | * | 0.91 | (0.82, 1.00) | * |
| ≥ National average, 12% | Ref ^b | | | | | |
| Poverty level | | | | | | |
| < National average, 14.3% | 1.01 | (0.93, 1.09) | | 0.98 | (0.88, 1.08) | |
| ≥ National average, 14.3% | Ref ^b | | | | | |
| Medicare Part D coverage | | | | | | |
| Exceeded | 1.08 | (0.88, 1.29) | | 0.91 | (0.66, 1.17) | |
| Not reached | 0.92 | (0.74, 1.09) | | 0.85 | (0.65, 1.05) | |
| Reached | Ref ^b | | | | | |
| Need Factors | | | | | | |
| Cancer diagnosis categories | | | | | | |
| Women with breast cancer | 1.18 | (1.08, 1.29) | ** | 1.59 | (1.47, 1.71) | *** |
| Women with colorectal cancer | 3.31 | (3.20, 3.42) | *** | 4.20 | (4.07, 4.33) | *** |
| Men with colorectal cancer | 3.78 | (3.67, 3.88) | *** | 2.80 | (2.67, 2.93) | *** |
| Men with prostate cancer | Ref ^b | | | | | |
| Cancer stage | | | | | | |
| 0/I | 0.65 | (0.55, 0.74) | *** | 0.71 | (0.60, 0.81) | *** |
| III/IV | 1.25 | (1.15, 1.34) | *** | 1.37 | (1.26, 1.47) | *** |
| II | Ref ^b | | | | | |

(continued on next page)

Based on 12,096 elderly fee-for-service Medicare beneficiaries with preexisting CAD and incident cancer diagnosis. Individuals with incident breast, colorectal, or prostate cancer were derived from the SEER registries. Weights were derived using the IPTW approach. The study used repeated measures design.

Time-invariant characteristics included cancer diagnosis categories, age, race/ethnicity, poverty status, high school education, CAD severity, concordant and discordant physical health conditions, SMI, and SEER region. Time-variant characteristics included tobacco use, alcohol use, depression, anxiety, routine follow-up with primary care physician and/or cardiologist, and Medicare Part D coverage.

Abbreviations: AOR, adjusted odds ratio; CAD, coronary artery disease; GEE, generalized estimating equations; IPTW, inverse treatment probability weighting; PHC, physical health condition; Sig, significance.

^aAsterisks represent significant differences in study population characteristics, derived from multinomial logistic regression models with repeated measures, that accounts for repeated measures design.

^bReference category for dependent variable is no hospitalization.

^cConsisted of diabetes, hyperlipidemia, hypertension, stroke, cardiac arrhythmia, and congestive heart failure.

^dConsisted of arthritis, asthma, chronic obstructive pulmonary disease, osteoporosis, dementia, human immunodeficiency virus, and hepatitis.

^eMental health conditions included anxiety, depression, and SMI (schizophrenia, bipolar disorder, and psychoses).

*.01 ≤ P < .05; **.001 ≤ P < .01; ***P < .001.

| eAppendix 4. Adjusted GEE Models With IPTW on CAD Hospitalization (cont.) | | | | | | |
|---|-----------------------------|--------------|------------------|-----------------------|--------------|------------------|
| Characteristics | CAD-Related Hospitalization | | | Other Hospitalization | | |
| | AOR | 95% CI | Sig ^a | AOR | 95% CI | Sig ^a |
| Cancer treatment | | | | | | |
| Cardiotoxic | 1.31 | (1.14, 1.49) | ** | 2.14 | (1.91, 2.37) | *** |
| None | 0.84 | (0.69, 0.98) | * | 1.07 | (0.86, 1.28) | |
| Non-cardiotoxic | Ref ^b | | | | | |
| Concordant PHC^c | | | | | | |
| Yes | 0.98 | (0.81, 1.15) | | 0.78 | (0.58, 0.98) | * |
| No | Ref ^b | | | | | |
| Discordant PHC^d | | | | | | |
| Yes | 1.23 | (1.16, 1.30) | *** | 1.19 | (1.11, 1.27) | *** |
| No | Ref ^b | | | | | |
| Mental health condition^e | | | | | | |
| Yes | 2.45 | (2.36, 2.54) | *** | 2.13 | (2.03, 2.23) | *** |
| No | Ref ^b | | | | | |
| CAD severity | 1.66 | (1.49, 1.83) | *** | 0.47 | (0.24, 0.69) | *** |
| Personal Health Behavior | | | | | | |
| Tobacco use | | | | | | |
| Yes | 1.44 | (1.29, 1.59) | *** | 0.86 | (0.63, 1.08) | |
| No | Ref ^b | | | | | |
| Alcohol use | | | | | | |
| Yes | 0.92 | (0.67, 1.17) | | 0.78 | (0.38, 1.18) | |
| No | Ref ^b | | | | | |
| Primary care visit | | | | | | |
| Yes | 4.14 | (4.02, 4.26) | *** | 3.26 | (3.12, 3.41) | *** |
| No | Ref ^b | | | | | |
| Cardiologist visit | | | | | | |
| Yes | 6.74 | (6.66, 6.83) | *** | 2.93 | (2.85, 3.02) | *** |
| No | Ref ^b | | | | | |
| External Environment | | | | | | |
| SEER region | | | | | | |
| Northeast | 0.98 | (0.89, 1.07) | | 0.74 | (0.63, 0.84) | *** |
| South | 1.05 | (0.95, 1.15) | | 0.70 | (0.58, 0.81) | *** |
| North-Central | 1.17 | (1.06, 1.27) | ** | 0.80 | (0.68, 0.93) | *** |
| West | Ref ^b | | | | | |
| Metropolitan status | | | | | | |
| Metropolitan | 0.72 | (0.63, 0.82) | *** | 0.89 | (0.77, 1.01) | |
| Nonmetropolitan | Ref ^b | | | | | |
| Time | 0.93 | (0.91, 0.96) | *** | 0.88 | (0.86, 0.91) | *** |

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Time-invariant characteristics included cancer diagnosis categories, age, race/ethnicity, poverty status, high school education, CAD severity, concordant and discordant physical health conditions, SMI, and SEER region. Time-variant characteristics included tobacco use, alcohol use, depression, anxiety, routine follow-up with primary care physician and/or cardiologist, and Medicare Part D coverage.

Abbreviations: AOR, adjusted odds ratio; CAD, coronary artery disease; GEE, generalized estimating equations; IPTW, inverse treatment probability weighting; PHC, physical health condition; Sig, significance.

^aAsterisks represent significant differences in study population characteristics, derived from multinomial logistic regression models with repeated measures, that accounts for repeated measures design.

^bReference category for dependent variable is no hospitalization.

^cConsisted of diabetes, hyperlipidemia, hypertension, stroke, cardiac arrhythmia, and congestive heart failure.

^dConsisted of arthritis, asthma, chronic obstructive pulmonary disease, osteoporosis, dementia, human immunodeficiency virus, and hepatitis.

^eMental health conditions included anxiety, depression, and SMI (schizophrenia, bipolar disorder, and psychoses).

*.01≤P<.05; **.001≤P<.01; ***P<.001.