

Improved Utilization of Preventive Services Among Patients Following Team-Based Annual Wellness Visits

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BACKGROUND The Annual Wellness Visit was designed to enhance preventive services utilization among Medicare beneficiaries; Annual Wellness Visits are underutilized with sparse documented effectiveness. Patients of 3 community-based and 2 retirement community outpatient clinics in western North Carolina had team-based Annual Wellness Visits over a 20-month program, with the goal of improving the uptake and delivery of the Annual Wellness Visit. A clinical pharmacist saw high-complexity patients (≥ 5 medications) and a licensed practical nurse saw low-complexity patients. We examined the effectiveness of team-based Annual Wellness Visits on patients' use of preventive services.

METHOD We conducted a retrospective chart review on a random sample of 500 patients for 12 months post-Annual Wellness Visit. Change over time in use of preventive services was assessed using McNemar's test. Adjusted relative risks of use within 6 months were calculated using generalized linear models with the Poisson loglinear function.

RESULTS Overall, utilization of Annual Wellness Visit increased from 14% at baseline to 44% after the 20-month program. The percentage of patients up-to-date with all recommended services increased from 17.4% at the Annual Wellness Visit to 42% within 6 months. Age-appropriate preventive screens and vaccines demonstrated the most improvement (55.8% to 75.4% and 36% to 52.2%, respectively). Community-based patients were less likely to obtain recommended services (RR = 0.618; 95% confidence interval [CI], 0.442-0.865), while patients with supplemental insurance (RR = 1.484; 95% CI, 1.023-2.153), patients seen in subsequent Annual Wellness Visits (RR = 1.405; 95% CI, 1.062-1.858), and patients who were men (RR = 1.422; 95% CI, 1.053-2.041) were more likely to obtain recommended services.

LIMITATIONS Generalization is limited by the pre-/post design of one organizational model.

CONCLUSION Team-based Annual Wellness Visits with a clinical pharmacist or an LPN, who were supervised by physicians, were associated with significantly improved utilization of preventive services. Use will likely continue to improve as more patients access team-based Annual Wellness Visits yearly.

In 2011, Medicare created the Annual Wellness Visit (AWV) to further encourage use of preventive clinical services [1]. Previous efforts to reduce out-of-pocket costs for preventive services included changes in Part B benefits and the introduction of a first preventive visit, the Welcome to Medicare Visit, in 2005. These efforts have done little to increase the use of preventive services among Medicare beneficiaries [2,3]. The percent of Medicare patients attending an AWV in 2015 was 17.7% nationally and 19.6% in North Carolina [4].

The AWV is available to all Medicare beneficiaries one year after obtaining Part B coverage [5]. These visits include screening for geriatric syndromes (eg, cognitive impairment), other behavioral risks (eg, alcohol and tobacco use), and functional level (eg, independence in activities of daily living). Personalized planning for recommended preventive services, including laboratory tests, vaccines, and screenings for cancer (eg, breast, colorectal) and other diseases (eg, osteoporosis), is also included [5-7].

The AWV provides reimbursement to primary care practices and may be delivered by non-physicians working with physicians. This includes advanced practice professionals, clinical pharmacists, and registered or licensed practical nurses [8].

Examining samples of Medicare utilization data from an epidemiological perspective, researchers report that the incorporation of preventive visits into Medicare Part B benefits has had minimal effect on the utilization of preventive services. Overall improvements have been modest, as the utilization of some services has improved significantly among specific cohorts (eg, beneficiaries with supplemental insurance), while utilization of other services has remained unchanged or decreased [9-11]. While utilization of preventive services was shown to be associated with the use of preventive visits, there is sparse literature specifically examining the outcomes of Medicare beneficiaries attending AWVs.

Several small studies report on the effectiveness of nurse-led or pharmacist-led wellness visits on post-visit uptake of preventive services [12-13]. Increased mammogram use was shown among women overdue for mammograms fol-

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lowing nurse-led visits as compared to women without wellness visits [12]. Increased use of breast and colorectal cancer screening, osteoporosis screening, and pneumococcal vaccination was documented among patients in a pilot of wellness visits involving teams of clinical pharmacists and medical students [13]. We also documented improvements in use of preventive services among patients seen in an outpatient clinic within a continuing care retirement community (CCRC); patients received an enhanced wellness visit with a Clinical Pharmacist Practitioner who provided comprehensive medication management for 6 months after the AWV [14-15].

Due to the promising results of our pilot, we received funding to implement team-based AWVs for Medicare recipients of 5 outpatient clinics—3 community-based clinics and 2 CCRCs—in western North Carolina.

Intervention

The AWV team consisted of 4 clinical pharmacists providing 1.5 full-time equivalents (FTE) for AWV, one licensed practical nurse (LPN; 0.5 FTE), a scheduler (0.5 FTE), and a supervising physician. Patients with Medicare were contacted via mail from the patients' primary care providers and subsequent phone calls by the scheduler; a patient registry was maintained to track appointments. AWVs were scheduled with either one of 4 Clinical Pharmacist Practitioners (high-complexity patients on ≥ 5 medications) or the LPN (low-complexity patients on ≤ 4 medications). The scheduled provider conducted all elements of the AWV office visit per Medicare requirements (see Table 1) [16-24]. The AWV providers developed personalized prevention plans with

patients documenting dates of completed or needed preventive services including vaccines, laboratory tests, and preventive screens. The AWV providers communicated results of abnormal screens and other concerns to the patients' primary care providers (physician or physician assistant) via the electronic health record, and made medication changes and/or referrals for follow-up within their scope of practice [5,8]. The supervising physician ensured appropriate training and ongoing clinical supervision for the AWV team. Our objective was to assess the effectiveness of the team-based AWV on receipt of preventive services at the visit and 6-12 months post-visit.

Methods

Authors SG and AP tracked the percentage of eligible patients who received an AWV over the course of the 20-month program from May 2014 through December 2015. We conducted a retrospective chart review of 500 randomly selected patients out of the 881 who received either the initial or subsequent AWV between July 1, 2014 and March 31, 2015. This 9-month period of AWVs was selected for study because internal audits indicated excellent compliance of AWV delivery beginning in July 2014 (2 months post initiation of the program), and because the March cutoff date allowed for a minimum follow-up period for patients to obtain recommended services (6 months: April-September) and for research staff to extract and analyze data (3 months: October-December). This project was approved by the Mission Hospital Institutional Review Board.

The sample size (N = 500 of 881 patients) was based on a desired 95% confidence interval of $\pm 2.5\%$, with an

TABLE 1.
Annual Wellness Visit (AWV) Elements Required by Medicare

| Required components of AWV [4] | | Standardized screening tools |
|--------------------------------|---|---|
| Patient history | Family; medical; surgical | |
| Vital signs | Height; weight; Body Mass Index (BMI); blood pressure | |
| Current medical care | All diagnoses; all specialists/caregivers; all medications | |
| Screening questions | Cognitive impairment | Mini-cog [16] |
| | Depression | Patient health questionnaire-2 or -9 [17] |
| | Functional status | Katz activities of daily living [18]; Lawton-Brady instrumental activities of daily living [19] |
| | Falls | Falls screening [20-22] |
| | Home safety | Centers for Disease Control home safety evaluation [21] |
| | Hearing | |
| | Smoking, and cessation if indicated | |
| | Alcohol use | |
| Risk factors | Identification of all relevant risks for common illnesses | |
| Preventive tests [23] | Colonoscopy (≤ 75 years); mammogram (women < 75 years); bone density scan (women); abdominal ultrasound (men 65-75 years w/smoking history) | |
| Laboratory tests [23] | Lipid panel; fasting blood glucose/glycosylated hemoglobin | |
| Vaccines [24] | PPSV-23 (pneumococcal); herpes zoster; Tdap/TD (tetanus/diphtheria/pertussis); influenza | |
| Personalized health advice | Medication management; written personal health screening plan for 5-10 years | |

expected 6-month follow-up rate of 25% [14,16]. A stratified random sample, based on month of visit, clinic (CCRC or community-based), AWV type (initial or subsequent), and patient complexity was generated using the random sample function of SPSS v21.0.1 (IBM; Chicago, IL). The percentage of patients with each combination of these 4 variables was calculated for the total population and used to create the representative random sample. Nine patients were found to be ineligible because they left care within 6 months, so the random selection process was repeated.

Our primary outcome was the percentage of patients who obtained all recommended, up to date clinical preventive services within 6 months of their team-based AWV. The 12-month up-to-date rate was assessed when available.

Data Collection

AWV Utilization. Prior to May 2014, billing reports were run to obtain the number of Medicare patients eligible for an AWV and determine who had received an AWV in the past 12 months. Over the 20-month program, we reran billing reports by team providers; totals were aggregated.

Outcomes. Patient characteristics and outcomes were extracted manually from the electronic health record including: age, gender, race, ethnicity, insurance, visit type (initial or subsequent), clinic (community-based or CCRC), and results of AWV questionnaires. Authors SG and AP extracted the details of prevention plans and searched for dates of subsequently received recommended services within 6 months and 6-12 months post-AWV.

Data were extracted by 2 reviewers. The lead reviewer trained her assistant and reviewed a random sample of data to ensure accurate data extraction.

Data Analyses

The percent of eligible Medicare patients who received an AWV in the past year was calculated at baseline and at the end of the 20-month program.

We coded ages into 4 categories: ≤ 65 , 66-74, 75-84 and ≥ 85 years old. Races and ethnicities were combined into white non-Hispanic, others, and unreported. Insurance categorizes included: Medicare, Medicare+supplemental insurance, or Medicare+Medicaid. We coded patients into one of 4 cohorts: High-complexity CCRC; High-complexity community; Low-complexity CCRC; and Low-complexity community.

We tallied the number of questionnaires completed at the AWV: Mini-Cog [16], falls assessment [20-22], Patient Health Questionnaire (PHQ)-2 or PHQ-9 [17], tobacco, alcohol, hearing, Activities of Daily Living [18], and Instrumental Activities of Daily Living [19]. Likewise, we summed the number of up-to-date preventive services at the AWV and those up-to-date within the subsequent 6-12 months. Services included: 2 laboratory tests, including a hyperlipidemia screen (lipid panel) and diabetes screen for patients with a hypertension diagnosis (glycated hemo-

globin test (HbA1c), or fasting plasma glucose); 4 vaccines, including pneumococcal, herpes zoster, adult tetanus/diphtheria or tetanus/diphtheria/pertussis (Td/Tdap), and influenza; and 5 preventive screens including mammogram (women < 75 years), dual-energy x-ray absorptiometry scan (DEXA; women ≥ 65), colorectal screening (colonoscopy or fecal occult blood; persons ≤ 75 years), abdominal ultrasound (men 65-75 years who smoked ever), and pap smear (women < 65) [6-7].

We included all patients of appropriate ages for specific laboratory tests, vaccines, and preventive screens in the up-to-date calculations [23-24]; we excluded patients with contraindications (eg, allergies) or prior surgeries precluding screening (eg, mastectomy). Declined services were considered "due."

We examined change over time in the percentage of patients that were up-to-date with all recommended preventive services (combined), and laboratory tests, vaccinations, and preventive screens (separate), using McNemar's test. To compare rates across cohorts, we used Chi square analyses. We planned generalized linear models with the Poisson loglinear function to calculate adjusted relative risks of obtaining services within 6 months post-AWV. We did not model predictors for obtaining laboratory tests, as the majority (96.8%) received testing. For all preventive services, vaccines, and preventive screens, we modeled main effects for: complexity, clinic, insurance, race/ethnicity, visit type, age, and sex. Significance was $P < 0.05$. All calculations were conducted using SPSS v.21.0.1 (IBM; Chicago, IL).

Results

AWV Utilization

Over the 20-month program, 2,049 AWVs were provided: 879 (42.9%) initial visits and 1,170 (57.1%) subsequent, yearly visits. In all, 1,584 patients obtained AWVs during these 20 months; 465 of these patients had 2 AWVs, as eligibility recurs every 12 months. For some, visits included both an initial and a subsequent visit, but for others it was 2 subsequent visits; these patients had an initial AWV prior to program initiation in May 2014. The percent of patients eligible for and up-to-date with obtaining an AWV increased from 14% at baseline (just prior to program implementation) to 44% at the program's termination.

Patient Characteristics

Of the 500 randomly selected patients, all obtained AWV and 6-month post-visit documented care; 393 (78.6%) had 12 months of post-visit care for review.

One of 4 clinical pharmacists saw 351 (70.2%) high-complexity patients, and the LPN saw 149 (29.8%) low-complexity patients (see Table 2). In all, 180 (36%) patients received care in CCRC clinics and 320 (64%) received care in community-based clinics. Fourteen patients (2.8%) were younger than 65 years old, indicating Medicare eligibility due to health conditions.

Patient characteristics differed significantly across the 4 cohorts (see Table 2). Older, predominantly white, non-Hispanic patients resided in CCRCs. Minorities comprised 28.4% of the community patients ($P = 0.001$). The majority of the CCRC patients' AWVs were initial visits, whereas the majority of the community patients' AWVs were subsequent visits ($P = 0.011$).

AWV Services

Overall, 494 patients (98.8%) had all 8 questionnaires completed at their AWV. For 6 patients (5 high-complexity, 1 low-complexity), we failed to find documentation of one of the following questionnaires: cognitive (1), falls (1), alcohol (2), and hearing screen (2).

Personal prevention plans were documented for 493 (98.6%) patients. Of the 7 patients without plans, 5 were high-complexity patients.

Preventive Services Within 6 Months Post-AWV

Only 87 (17.4%) patients were completely up-to-date at their AWV with all person-specific recommendations for preventive services. That increased to 210 (42%) by 6 months post-AWV (see Table 3). Significant improvements over time occurred for all cohorts.

The percentage of patients up-to-date differed significantly across cohorts at the AWV ($P = 0.001$) and 6 months post-AWV ($P = 0.001$). High-complexity patients from CCRCs were most likely to be up-to-date with preventive services at 6 months (see Table 3).

Laboratory Tests. Overall, 116 (23.2%) patients were due for a laboratory test at their AWV and 384 (76.8%) were up-to-date; 484 (96.8%) patients obtained recommended laboratory tests by 6 months post-AWV (see Table 4). All cohorts made significant improvements. CCRC patients

were more likely to be up-to-date with laboratory tests at the AWV ($P = 0.001$); cohorts had similar rates at 6 months post-AWV ($P = 0.409$).

The percentages of patients up-to-date with each laboratory test, vaccine, and preventive screen are shown in Table 5. Rates of cholesterol testing for patients ≤ 75 years old varied non-significantly at the AWV ($P = 0.092$) but significantly at 6 months post-AWV (0.010); percentages ranged from 81.8% to 98.7%. Among patients with hypertension, cohorts did not vary significantly at the AWV ($P = 0.069$) or at 6 months post-AWV ($P = 0.764$); 98.2% had recommended glucose testing at 6 months post-AWV.

Vaccines. Overall, 320 (64%) patients were due for a vaccine at the AWV. Eighty-one (16.2%) people obtained all recommended vaccines by 6 months post-AWV for a significantly improved rate of 52.2%. All cohorts significantly improved their rate of adherence to vaccine recommendations. CCRC patients had the highest rate of adherence at the AWV ($P = 0.015$) and 6 months post-AWV ($P = 0.001$; see Table 4); a minority of community patients obtained needed vaccines.

The percentage of patients who obtained recommended vaccines by 6 months varied greatly by vaccine type (see Table 5). Adherence to the pneumococcal vaccine recommendation was similar across the cohorts at AWVs ($P = 0.213$) and at 6 months post-AWV, ranging from 89.9% to 98.6% ($P = 0.118$). The rates of adherence to all other vaccines varied significantly at both assessments (flu $P = 0.001$, $P = 0.005$, respectively; Td/Tdap $P = 0.002$, $P = 0.028$; herpes zoster $P = 0.001$, $P = 0.001$). Adherence to the herpes zoster vaccine was lowest, ranging from 48.8% to 82.9%.

Preventive Screens. Overall, 279 (55.8%) patients were up-to-date on preventive screens at the time of their AWV; 98 additional people obtained all recommended screens,

TABLE 2.
Comparison of Patient Characteristics Across Complexity Level and Clinic

| | Total N (%) | High-complexity | | Low-complexity | | P |
|-----------------------|----------------|-----------------|--------------------|----------------|--------------------|-------|
| | | CCRC N (%) | Community N (%) | CCRC N (%) | Community N (%) | |
| Total | 500 (100) | 111 (22.2) | 240 (48) | 69 (13.8) | 80 (16) | |
| Men | 173 (34.6) | 35 (31.5) | 90 (37.5) | 18 (26.1) | 30 (37.5) | |
| Women | 327 (65.4) | 76 (68.5) | 150 (62.5) | 51 (73.9) | 50 (62.5) | 0.277 |
| ≤ 65 years | 80 (16) | 0 | 12 (5) | 0 | 2 (2.5) | |
| 66-74 years | 240 (48) | 11 (9.9) | 142 (59.2) | 21 (30.4) | 54 (67.5) | |
| 75-84 years | 69 (13.8) | 46 (41.4) | 59 (24.6) | 24 (34.8) | 17 (21.3) | |
| ≥ 85 years | 111 (22.2) | 54 (48.6) | 27 (11.3) | 24 (34.8) | 7 (8.8) | 0.001 |
| White non-Hispanic | 402 (80.4) | 110 (99.1) | 175 (72.9) | 63 (91.3) | 54 (67.5) | |
| Others | 31 (6.2) | 0 | 18 (7.5) | 5 (7.2) | 8 (10) | |
| Unreported | 67 (13.4) | 1 (0.9) | 47 (19.6) | 1 (1.4) | 18 (22.5) | 0.001 |
| Medicare | 118 (23.6) | 11 (9.9) | 73 (30.4) | 13 (18.8) | 21 (26.2) | |
| Medicare+Supplemental | 342 (68.4) | 99 (89.2) | 133 (55.4) | 54 (78.3) | 56 (70) | |
| Medicare+Medicaid | 40 (8) | 1 (0.9) | 34 (14.2) | 2 (2.9) | 3 (3.8) | 0.001 |
| Initial AWV | 261 (52.2) | 72 (64.9) | 116 (48.3) | 38 (55.1) | 35 (43.8) | |
| Subsequent AWV | 239 (47.8) | 39 (35.1) | 124 (51.7) | 31 (44.9) | 45 (56.3) | 0.011 |

Note. AWV, annual wellness visit; CCRC, continuing care retirement community

TABLE 3.
Overall Adherence to Recommended Preventive Services

| | Total | At AWV N (%) | At 6-months N (%) | Change over time P |
|---------------------------|---------|-----------------|----------------------|-----------------------|
| | N = 500 | 87 (17.4) | 210 (42) | 0.001 |
| High-complexity CCRC | N = 111 | 31 (27.9) | 58 (52.3) | 0.001 |
| High-complexity community | N = 240 | 25 (10.4) | 77 (32.1) | 0.001 |
| Low-complexity CCRC | N = 69 | 17 (27.9) | 24 (34.8) | 0.001 |
| Low-complexity community | N = 80 | 14 (17.5) | 30 (37.5) | 0.001 |

Note. AWV, annual wellness visit; CCRC, continuing care retirement community

thus 377 (75.4%) were up-to-date within 6 months (see Table 4). All 4 cohorts significantly improved over time. High-complexity CCRC patients were more likely to obtain needed preventive tests (83.8%) than the other groups. No differences were seen across the cohorts for any specific preventive screen at either assessment ($P > 0.05$) (see Table 5).

Adherence With Recommended Preventive Services Within 12 Months of the Visit

Two hundred ninety patients (58%) were still overdue for some recommended preventive service at 6 months post-AWV; of those, 229 (79%) had follow-up through 12 months. Eleven patients (4.8%) obtained needed preventive services over the additional 6 months; 4 laboratory tests, 4 vaccines, and 3 preventive screens.

Predictors of Adherence to Recommended Preventive Services

The adjusted relative risks for obtaining preventive services within 6 months post-AWV are in Table 6. Community-based residents were 38% less likely to obtain needed services than CCRC residents. Male patients and patients

with supplemental insurance were more likely to obtain needed services, 42% and 48% respectively. Patients were 40% more likely to obtain all services following subsequent AWVs. Clinic and insurance type predicted vaccine uptake. Age predicted obtaining preventive screens.

Discussion

Utilizing team-based AWVs, we tripled the percent of patients obtaining AWVs. While far from ideal, 44% was considerably higher than the North Carolina 2015 rate of 19.6%.

We found significant improvements in the percentage of Medicare patients who obtained needed preventive services following their Medicare AWV with either a Clinical Pharmacist Practitioner or an LPN. Only 17.4% of patients were up-to-date with services at their AWV, and this increased to 42% by 6 months.

This improved adherence is substantially better than the modest gains reported by Jensen and coauthors, who examined a nationally representative sample of 15,044 Medicare seniors, and Chung and colleagues, who reported marginal increases in preventive services among 204,388 Medicare beneficiaries [9,11]. However, both studies examined utiliza-

TABLE 4.
Rate of Adherence to All Person-Specific Recommended Laboratory Tests, Vaccines, and Preventive Screens

| | Total | At AWV N (%) | At 6-months N (%) | Change over time P |
|---------------------------|---------|-----------------|----------------------|-----------------------|
| Laboratory tests | N = 500 | 384 (76.8) | 484 (96.8) | 0.001 |
| High-complexity CCRC | N = 111 | 101 (91) | 108 (97.3) | 0.016 |
| High-complexity community | N = 240 | 173 (72.1) | 234 (97.5) | 0.001 |
| Low-complexity CCRC | N = 69 | 59 (85.5) | 67 (97.1) | 0.008 |
| Low-complexity community | N = 80 | 51 (63.8) | 75 (93.8) | 0.001 |
| Vaccines | N = 500 | 180 (36) | 261 (52.2) | 0.001 |
| High-complexity CCRC | N = 111 | 44 (39.6) | 69 (62.2) | 0.001 |
| High-complexity community | N = 240 | 73 (30.4) | 107 (44.6) | 0.001 |
| Low-complexity CCRC | N = 69 | 35 (50.7) | 50 (72.5) | 0.001 |
| Low-complexity community | N = 80 | 28 (35) | 35 (43.8) | 0.016 |
| Preventive Screens | N = 500 | 279 (55.8) | 377 (75.4) | 0.001 |
| High-complexity CCRC | N = 111 | 72 (64.9) | 93 (83.8) | 0.001 |
| High-complexity community | N = 240 | 121 (50.4) | 168 (70.0) | 0.001 |
| Low-complexity CCRC | N = 69 | 39 (56.5) | 54 (78.3) | 0.001 |
| Low-complexity community | N = 80 | 47 (58.5) | 62 (77.5) | 0.001 |

Note. AWV, annual wellness visit; CCRC, continuing care retirement community

TABLE 5.
Rate of Adherence to Person-specific and Recommended Laboratory Tests,
Vaccines, and Preventive Screens

| | Total | At AWV N (%) | At 6-months N (%) |
|---|--------------|------------------------|-----------------------------|
| Lipids (persons ≤ 75 years) | N = 242 | 147 (60.7) | 232 (95.9) |
| High-complexity CCRC | N = 11 | 4 (36.4) | 9 (81.8) |
| High-complexity community | N = 154 | 99 (64.3) | 152 (98.7) |
| Low-complexity CCRC | N = 21 | 15 (71.4) | 19 (90.5) |
| Low-complexity community | N = 56 | 29 (51.8) | 52 (92.9) |
| Diabetes screening (hypertension) | N = 329 | 295 (89.7) | 323 (98.2) |
| High-complexity CCRC | N = 79 | 76 (96.2) | 78 (98.7) |
| High-complexity community | N = 177 | 158 (89.3) | 173 (97.7) |
| Low-complexity CCRC | N = 36 | 31 (86.1) | 36 (100) |
| Low-complexity community | N = 37 | 30 (81.1) | 36 (97.3) |
| Influenza | N = 500 | 403 (80.6) | 439 (87.8) |
| High-complexity CCRC | N = 111 | 99 (89.2) | 105 (94.6) |
| High-complexity community | N = 240 | 187 (77.9) | 211 (87.9) |
| Low-complexity CCRC | N = 69 | 60 (87) | 61 (88.4) |
| Low-complexity community | N = 80 | 57 (71.3) | 62 (77.5) |
| Td/Tdap | N = 498 | 335 (67.3) | 388 (77.9) |
| High-Complexity CCRC | N = 111 | 58 (52.3) | 83 (74.8) |
| High-Complexity Community | N = 238 | 167 (70.2) | 177 (74.4) |
| Low-Complexity CCRC | N = 69 | 50 (72.5) | 62 (89.9) |
| Low-Complexity Community | N = 80 | 60 (75) | 66 (82.5) |
| Herpes zoster | N = 493 | 281 (57) | 317 (64.3) |
| High-complexity CCRC | N = 111 | 86 (77.5) | 92 (82.9) |
| High-complexity community | N = 233 | 110 (47.2) | 131 (56.2) |
| Low-complexity CCRC | N = 69 | 52 (75.4) | 55 (79.7) |
| Low-complexity community | N = 80 | 33 (41.3) | 39 (48.8) |
| Pneumococcal | N = 492 | 433 (88) | 466 (94.7) |
| High-complexity CCRC | N = 111 | 100 (90.1) | 106 (95.5) |
| High-complexity community | N = 233 | 207 (88.8) | 221 (94.8) |
| Low-complexity CCRC | N = 69 | 62 (89.9) | 68 (98.6) |
| Low-complexity community | N = 79 | 64 (81.0) | 71 (89.9) |
| Mammogram (women < 75 years) | N = 141 | 102 (72.3) | 111 (78.7) |
| High-complexity CCRC | N = 5 | 4 (80) | 4 (80) |
| High-complexity community | N = 88 | 62 (70.5) | 70 (79.5) |
| Low-complexity CCRC | N = 14 | 12 (85.7) | 12 (85.7) |
| Low-complexity community | N = 34 | 24 (70.6) | 25 (73.5) |
| DEXA scan (women ≥65 years) | N = 320 | 156 (48.8) | 255 (79.7) |
| High-complexity CCRC | N = 76 | 39 (51.3) | 60 (78.9) |
| High-complexity community | N = 143 | 69 (48.3) | 116 (81.1) |
| Low-complexity CCRC | N = 51 | 25 (49) | 40 (78.4) |
| Low-complexity community | N = 50 | 23 (46) | 39 (78) |
| Colorectal screening (persons ≤ 75 years) | N = 242 | 185 (76.4) | 204 (84.3) |
| High-complexity CCRC | N = 11 | 8 (72.7) | 9 (81.8) |
| High-complexity community | N = 154 | 115 (74.7) | 125 (81.2) |
| Low-complexity CCRC | N = 21 | 17 (81.0) | 19 (90.5) |
| Low-complexity community | N = 56 | 45 (80.4) | 51 (91.1) |
| Pap smear (women < 65) | N = 2 | 2 (100) | 2 (100) |
| High-complexity CCRC | N = 0 | 2 (100) | |
| High-complexity community | N = 2 | | 2 (100) |
| Low-complexity CCRC | N = 0 | | |
| Low-complexity community | N = 0 | | |
| Abdominal US (men 65-75 years ever smoked) | N = 46 | 26 (56.5) | 30 (65.2) |
| High-complexity CCRC | N = 1 | 1 (100) | 1 (100) |
| High-complexity community | N = 30 | 15 (50) | 17 (56.7) |
| Low-complexity CCRC | N = 6 | 3 (50) | 4 (66.7) |
| Low-complexity community | N = 9 | 7 (78) | 8 (88.9) |

Note. AWV, annual wellness visit; CCRC, continuing care retirement community; DEXA, dual-energy x-ray absorptiometry scan; Td/Tdap, adult tetanus/diphtheria or tetanus/diphtheria/pertussis; US, ultrasound

TABLE 6.
Relative Risks of Predictors of Obtaining Person-Specific Recommended Preventive Services

| Variables | Predictor | Referent | Outcomes: Up-to-date with services | | | | | |
|------------|--------------------|-----------------------|------------------------------------|--------------|---------------------|--------------|-----------------------------|--------------|
| | | | Model 1 All preventive services | | Model 2 Vaccines | | Model 3 Preventive tests | |
| | | | Relative risk | 95% CI | Relative risk | 95% CI | Relative risk | 95% CI |
| Complexity | High risk | Low risk | 0.298 | 0.179, 0.496 | 1.010 | 0.773, 1.320 | 1.052 | 0.840, 1.316 |
| Residence | CCRC | Community | 0.618* | 0.442, 0.865 | 0.609* | 0.448, 0.828 | 1.041 | 0.810, 1.339 |
| Insurance | Medicare | Medicare+Supplemental | 1.484* | 1.023, 2.153 | 1.466* | 1.053, 2.041 | 1.142 | 0.885, 1.473 |
| | | Medicare+Medicaid | 0.520 | 0.198, 1.365 | 0.699 | 0.347, 1.405 | 0.839 | 0.498, 1.414 |
| Race | White non-Hispanic | Other, unknown | 0.872 | 0.440, 1.728 | 0.878 | 0.484, 1.593 | 0.744 | 0.445, 1.242 |
| | | | 1.041 | 0.659, 1.645 | 1.164 | 0.787, 1.724 | 0.907 | 0.653, 1.261 |
| Visit type | Initial AWV | Subsequent AWV | 1.405* | 1.062, 1.858 | 1.240 | 0.965, 1.593 | 1.184 | 0.962, 1.457 |
| Age | 66-74 years | ≤ 65 years | 0.701 | 0.167, 2.953 | 1.258 | 0.530, 2.988 | 0.797 | 0.344, 1.849 |
| | | 75-84 years | 1.047 | 0.744, 1.474 | 0.821 | 0.602, 1.120 | 1.329* | 1.032, 1.710 |
| | | ≥ 85 years | 0.931 | 0.628, 1.379 | 0.718 | 0.502, 1.028 | 1.274 | 0.949, 1.711 |
| Gender | Women | Men | 1.422* | 1.076, 1.878 | 1.192 | 0.926, 1.535 | 1.205 | 0.976, 1.487 |

Note. AWV, annual wellness visit; CCRC, continuing care retirement community; CI, confidence interval
*Indicates $P < 0.05$

tion rates overall—not just among patients obtaining AWVs.

When examining 34 patients from pharmacist-led AWVs, Zorek and colleagues reported the uptake of some preventive services increased significantly, including pneumococcal vaccines (85%), mammograms (76%), bone density scans (91%), and fecal occult blood tests (76%). However, the follow-up period was one month, and patients were coded up-to-date if they had scheduled but not yet received services [13]. Tetun and coauthors compared utilization of preventive services across cohorts of Medicare beneficiaries overdue for services; 102 patients receiving nurse-led AWVs were compared to a cohort without AWVs. Within 3 months, documented use of mammography was significantly better following nurse-led visits (20% vs. 68.6%, respectively). A non-significant improvement was noted for colonoscopy (4.7% vs. 17.9%, respectively) [12]. Our patients' actual use within 6 months equaled 94.7% for pneumococcal vaccination, 78.7% for mammography, 79.7% for bone density scans, and 84.3% for colorectal cancer screening.

Adherence to laboratory tests increased to 96.8%. This is consistent with the national rate of 90.5% for cholesterol testing among Medicare beneficiaries > 64 years old [11]. Laboratory tests can be done in-house, often on the same day, and patients demonstrated considerably higher adherence with laboratory test recommendations than vaccines and preventive screens.

Our AWV patients significantly improved utilization of all preventive services. Patients most likely to adhere to recommendations were: men, CCRC residents, purchasers of supplemental insurance, or attendees of subsequent AWVs. Men have fewer recommended preventive screens, which might make adherence easier. Ozminowski and colleagues also found men were more likely to obtain all recommended services [2]. Interestingly, Jensen and coauthors reported more men had supplemental insurance than women, and people with supplemental insurance were more likely to use preventive services [11]. Likewise, Tetun and col-

leagues reported women with supplemental insurance were more likely to obtain mammograms than those without [12]. Ozminowski and colleagues reported lower income and dual-eligible beneficiaries were less likely to use preventive services, as were employed beneficiaries [2].

Most preventive services are covered by Medicare; however, coverage for some vaccinations is dependent on prescription insurance plans, and preventive screenings converted to therapeutic intervention are not covered fully (eg, screening colonoscopies become therapeutic when polyps are removed) [25]. Having supplemental insurance to help offset potential expenses may enable patients to pursue preventive services such as colorectal screening [9, 11]. However, evidence regarding costs as a barrier to screening is mixed. Few patients indicated costs were a barrier, and despite variability in socio-economic status across cohorts, improvements to Medicare coverage over time had minimal effect on overall utilization rates [2, 11, 25].

Six-month adherence to vaccination recommendations increased significantly, yet only a slight majority was vaccinated. Vaccination was related to CCRC residency and having supplemental insurance. Vaccines available in-house and covered by Medicare, such as influenza, showed higher adherence; our patients had an uptake rate at 6 months post-AWV of 87.8%, compared to 66.7% of US adults over 64 years in 2014-2015 [26]. Likewise, pneumococcal vaccines are covered by Medicare [27], and uptake was very good (94.7%) versus 69.3% of US adults over 64 years [28]. Medicare pays variably for the herpes zoster vaccine for prevention of shingles, but many patients must go to pharmacies to be vaccinated [27]. Nevertheless, 64.3% of our patients were vaccinated compared to 31.1% of patients over 64 years old nationwide [28]. Medicare does not pay for the Td or Tdap unless in conjunction with an injury [25], yet adherence reached 77.9%, just slightly above the nationwide rate of 71.7%, for adults over 64 years old [28].

Ozminowski and colleagues reported patients with bet-

ter health status and fewer chronic conditions were less likely to obtain preventive services [2]. However, we did not find an effect of medical complexity on uptake of overdue preventive services. Even though 62% of CCRC patients were high-complexity as compared to 75% of community-based patients, we found that CCRC residents were more likely to obtain preventive services than community-based patients. Of note, CCRC residents were more likely to have supplemental insurance. However, since most patients indicate costs are not a barrier, perhaps a heightened perception of risk to one's health contributes to both having supplemental health insurance and adhering to healthcare recommendations.

We found patients attending subsequent AWWs were more likely to follow-up on needed services. Possibly, patients attending initial AWWs have more preventive services needed and thus find it harder to complete them, or perhaps a subsequent personalized prevention plan detailing the same outstanding preventive services carries more influence.

We found that among the sizeable subset of patients with 12-month follow-up, additional adherence after the 6-month post-AWW mark was small; 6 months seems a reasonable follow-up duration. We utilized documentation of preventive services within our electronic health record as evidence of adherence to recommendations; thus, we may have underestimated the percentage of patients receiving services obtained outside our clinics (eg, colonoscopy, vaccines). Generalization of results is limited by use of clinics within one organization in one area of western North Carolina; findings may not be consistent with other regions of the United States with greater ethnic and racial diversity and/or varied access to preventive services.

Conclusion

In conclusion, our team demonstrated excellent fidelity to the Medicare AWW model implemented with our clinical specifications for screenings, personalized prevention planning, and physician communication/referral processes. Our patients demonstrated significant improvements in adherence rates to preventive services recommendations over 6 months following AWWs. Variability in adherence between communities of residency, gender, age, insurance coverage, and type of AWW may guide team providers in the personalized prevention plan development and outreach services for future AWWs. *NCMJ*

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Conflicts of Interest. All authors have no relevant conflicts of interest.

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