The Association of Adherence with Health-Related Quality of Life by Age Group Among Patients with Epilepsy

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BACKGROUND

- Epilepsy is a chronic disorder of the brain, characterized by recurrent seizures.[1]
- Active epilepsy affects an estimated 1.0% (2.3 million) of the US adult population.[2]
- Existing studies show that non-adherence to antiepileptic medications (AEDs) is associated with reduced seizure control, lower health-related quality of life (HRQoL), decreased productivity, and seizure-related job loss.[3-4]
- Although non-adherence to AEDs affects HRQoL, little is known about how age may influence this relationship among patients with epilepsy.

OBJECTIVE

- To examine the association between adherence and HRQoL by age group among patients with epilepsy. Additionally, patient demographics, health characteristics and epilepsy characteristics were examined as predictors of HRQoL by age group.

METHODS

Data source

- Data from the 2011 (N=75,000), 2012 (N=71,157), and 2013 (N=75,000) US National Health and Wellness Survey (NHWS) were analyzed.
- The NHWS is a self-administered, Internet-based questionnaire from a sample of adults (aged 18 or older).

Sample

- This sample included those who self-reported being treated with any AED type and/or Rx for epilepsy (Total N=1,126) and grouped as:
  - — Under 55 years old with low/medium adherence (n=366)
  - — Under 55 years old with complete adherence (n=377)
  - — 55 years or older with low/medium adherence (n=114)
  - — 55 years or older with complete adherence (n=269)

Measures

Potential predictors: demographics, health characteristics, and epilepsy characteristics

- Demographics: age, gender, race/ethnicity, education, household income, and insurance.
- Health characteristics: body mass index (BMI), smoking status, alcohol use, exercise behavior, and the Charlson comorbidity index (CCI).
- Epilepsy-specific characteristics: years since epilepsy diagnosis and whether on monotherapy (1 AED) or adjunctive therapy (2+ AEDs).

Adherence

- Medication adherence was assessed with the 8-item Morisky Medication Adherence Scale (MMAS; survey years 2012-2013) or the 4-item Morisky Medication Adherence Scale (survey year 2011).
- Only corresponding items between the 8-item and 4-item MMAS were used to compute adherence, which was coded as high (complete adherence; score=0) vs. low/medium (scores >0).

Health-related quality of life

- Component summary scores from the Medical Outcomes Study 36-Item Short Form Survey Instrument version 2 (SF-36v2; survey years 2012 and 2013) or SF-12v2 (survey year 2011) were calculated
  - — The physical component summary (PCS) and the mental component summary (MCS); population norm=50 (SD=10).
- The items from the SF-36v2/SF-12v2 were also used to derive a health utility score, using the SF-6D algorithm.
  - — The health utility score ranges from 0 (a health state equivalent to death) to 1 (a health state equivalent to perfect health).

Statistical analyses

Bivariate analyses

- One-way ANOVAs (for continuous variables) and chi-square tests (for categorical variables) were conducted comparing demographics and health characteristics (e.g., age, gender, CCI), and epilepsy characteristics (i.e., years diagnosed with epilepsy and monotherapy vs. adjunctive therapy) by age groups.
- Additionally, HRQoL (MCS, PCS, SF-6D health utilities) were compared by age and adherence groups.
- All multiple pairwise comparisons were conducted with t-tests (continuous variables) or z-tests of column proportions (categorical variables) and adjusted using the Bonferroni correction.

Multivariable analyses

- Separate generalized linear models (GLMs) for the two age groups (under 55 and 55 years and older) were used to predict MCS, PCS, and SF-6D health utilities by low/medium adherence (vs. complete adherence), controlling simultaneously for clinically meaningful predictors and all significant predictors in bivariate analyses.

Any two-sided $p<0.05$ was considered statistically significant.

RESULTS

Sample characteristics (Table 1)

- Mean age was 46.3 years old (SD=14.92); 47.7% female.
- A significantly higher proportion of patients under 55 (n=743) vs. 55 and older (n=383) had low/medium adherence (49.3% vs. 29.8%, $p<0.001$).
- Among patients under 55, a significantly smaller proportion of those aged 18 to <25, 25 to <35, and 35 to <45 had complete adherence than those 45 to <55 (42.1%, 44.8%, 47.5% vs. 63.9%, respectively, $p<0.05$).

HRQoL: unadjusted comparisons (Table 2)

- Among patients under age 55, those with low/medium adherence had lower MCS than those with complete adherence (means=40.92 vs. 44.02, $p<0.05$).
  - PCS, and health utilities did not differ by adherence among patients under age 55.
- MCS, PCS, and health utilities did not differ by adherence among patients aged 55 and older.

Table 1: Patient demographics, health characteristics, and epilepsy characteristics by age groups

		Age Groups						
		Under 55 Years N=743		55 Years or Older N=383		Total N=1126		
		M / %	SD / N	M / %	SD / N	M / %	SD / N	p-value
Age		37.61_a	9.73	63.24_b	6.11	46.33	14.92	**<0.001**
Charlson Comorbidity Index (CCI)		0.92_a	3.05	0.99_a	1.38	0.94	2.60	0.674
Years diagnosed with epilepsy		19.33_a	13.41	34.37_b	18.10	24.49	16.77	**<0.001**
Gender	Female	$51.5\%_a$	383	$40.2\%_b$	154	47.7%	537	**<0.001**
	Male	$48.5\%_a$	360	$59.8\%_b$	229	52.3%	589	
Race/Ethnicity	non-Hispanic white	$70.4\%_a$	523	$86.7\%_b$	332	75.9%	855	**<0.001**
	non-Hispanic black	$11.3\%_a$	84	$6.3\%_b$	24	9.6%	108	
	Hispanic	$9.4\%_a$	70	$2.9\%_b$	11	7.2%	81	
	other	$8.9\%_a$	66	$4.2\%_b$	16	7.3%	82	
Do you currently have health insurance?	Yes	$83.7\%_a$	622	$90.1\%_b$	345	85.9%	967	**0.004**
	No	$16.3\%_a$	121	$9.9\%_b$	38	14.1%	159	
BMI Category	underweight	$2.4\%_a$	18	$2.6\%_a$	10	2.5%	28	**0.001**
	normal	$34.5\%_a$	256	$23.8\%_b$	91	30.8%	347	
	overweight	$27.1\%_a$	201	$34.2\%_b$	131	29.5%	332	
	obese	$33.0\%_a$	245	$38.1\%_a$	146	34.7%	391	
	unknown	$3.1\%_a$	23	$1.3\%_a$	5	2.5%	28	
Smoking Status	Current	$26.0\%_a$	193	$19.1\%_b$	73	23.6%	266	**<0.001**
	Former	$20.5\%_a$	152	$40.7\%_b$	156	27.4%	308	
	Never Smoker	$53.6\%_a$	398	$40.2\%_b$	154	49.0%	552	
Drink Alcohol	No	$44.8\%_a$	333	$62.1\%_b$	238	50.7%	571	**<0.001**
	Yes	$55.2\%_a$	410	$37.9\%_b$	145	49.3%	555	
Exercise 20+ minutes 1+ past month	0 times	$37.0\%_a$	275	$53.3\%_b$	204	42.5%	479	**<0.001**
	1+ times	$63.0\%_a$	468	$46.7\%_b$	179	57.5%	647	
Therapy	Monotherapy (1 AED)	$65.8\%_a$	489	$66.6\%_a$	255	66.1%	744	0.797
	Combo-therapy (2+)	$34.2\%_a$	254	$33.4\%_a$	128	33.9%	382	

Note: P-value column represents values from overall ANOVAs (continuous variables) or chi-square tests (categorical variables). Values in the same row not sharing the same subscript are significantly different at p< 0.05 in t-tests (continuous variables) or z-tests of column proportions (categorical variables).
Tests are adjusted for all pairwise comparisons using the Bonferroni correction.
Abbreviations: M=Mean; SD=Standard Deviation; BMI=Body Mass Index.

Table 2: Health-related quality of life by age and adherence groups (unadjusted comparisons)

	Age and Adherence Groups										
	<55 Low/Med Adherence N=366		<55 Complete Adherence N=377		55+ Low/Med Adherence N=114		55+ Complete Adherence N=269		Total N=1126		p-value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Mental Component Summary	40.92_a	11.45	44.02_b	12.18	$46.40_{b,c}$	12.51	48.64_c	11.51	44.36	12.17	**<0.001**
Physical Component Summary	47.27_a	10.19	46.30_a	10.71	$44.33_{a,b}$	12.13	43.34_b	11.80	45.71	11.06	**<0.001**
SF6D Health Utilities	0.65_a	0.13	$0.68_{a,b}$	0.16	$0.67_{a,b}$	0.14	0.69_b	0.15	0.67	0.15	**0.012**

Note: P-value column represents values from overall ANOVAs. Values in the same row not sharing the same subscript are significantly different at p< 0.05 in t-tests.
Tests are adjusted for all pairwise comparisons using the Bonferroni correction.
Abbreviations: SD=Standard Deviation.

Predictors of HRQoL by age group (Table 3)

- For those under 55, low/medium vs. complete adherence predicted lower MCS (adjusted means: 41.15 vs. 43.84) and health utilities (adjusted means: 0.654 vs. 0.675; each $p<0.05$).
- In contrast, adherence did not predict MCS, PCS, or health utilities for those 55 and older.
- Relative to adherence, CCI and smoking status were consistently significant predictors of lower MCS, PCS, and health utilities for both age groups.
- Monotherapy was predictive of higher MCS for those aged 55 and older, and predictive of higher PCS for those under age 55.

Table 3: Significant predictors of health-related quality of life by age group (multivariable results)

	Under 55 Years Old					55 Years and Older				
			95% Confidence Interval					95% Confidence Interval		
	B	SE	Lower	Upper	p-value	B	SE	Lower	Upper	p-value
Mental Component Summary Score (MCS)										
Years diagnosed	0.15	0.03	0.09	0.21	**<0.001**	0.06	0.03	0.00	0.13	0.069
BMI: Obese	-3.38	1.03	-5.40	-1.36	**0.001**	-1.06	1.55	-4.11	1.99	0.495
CCI	-0.46	0.14	-0.73	-0.18	**0.001**	-1.31	0.45	-2.18	-0.44	**0.003**
Low/Med Adher	-2.64	0.83	-4.27	-1.01	**0.002**	-2.39	1.28	-4.90	0.13	0.063
Current smoker	-2.85	1.03	-4.87	-0.83	**0.006**	-4.10	1.80	-7.62	-0.58	**0.022**
Underweight	-6.86	2.74	-12.24	-1.48	**0.012**	-3.11	3.90	-10.76	4.55	0.426
Former smoker	2.71	1.09	0.57	4.85	**0.013**	-0.57	1.34	-3.20	2.05	0.668
Monotherapy	1.09	0.89	-0.65	2.83	0.220	2.92	1.27	0.44	5.40	**0.021**
Physical Component Summary Score (PCS)										
Current smoker	-5.11	0.88	-6.82	-3.39	**<0.001**	-2.83	1.56	-5.89	0.22	0.069
BMI: Obese	-4.49	0.87	-6.20	-2.78	**<0.001**	-4.41	1.35	-7.05	-1.77	**0.001**
CCI	-0.77	0.12	-1.00	-0.53	**<0.001**	-3.04	0.39	-3.79	-2.28	**<0.001**
Former smoker	-2.84	0.93	-4.65	-1.02	**0.002**	-2.49	1.16	-4.76	-0.21	**0.032**
Drink alcohol	2.21	0.75	0.74	3.69	**0.003**	2.99	1.09	0.86	5.11	**0.006**
Exercise 0x/month	-2.08	0.77	-3.59	-0.57	**0.007**	-4.54	1.05	-6.59	-2.49	**<0.001**
Monotherapy	1.49	0.75	0.01	2.97	**0.049**	-0.47	1.10	-2.63	1.68	0.667
Gender: Male	1.42	0.74	-0.02	2.86	0.054	3.10	1.05	1.04	5.15	**0.003**
Underweight	-3.71	2.33	-8.28	0.86	0.111	-6.68	3.39	-13.32	-0.03	**0.049**
BMI Unknown	-2.46	2.15	-6.68	1.76	0.253	-9.08	4.55	-18.00	-0.17	**0.046**
Years diagnosed	0.01	0.03	-0.04	0.07	0.694	0.09	0.03	0.03	0.15	**0.003**
SF-6D Health Utilities										
Current smoker	-0.063	0.013	-0.088	-0.038	**<0.001**	-0.069	0.020	-0.108	-0.029	**0.001**
BMI: Obese	-0.048	0.013	-0.073	-0.023	**<0.001**	-0.063	0.017	-0.097	-0.029	**<0.001**
CCI	-0.008	0.002	-0.011	-0.004	**<0.001**	-0.027	0.005	-0.037	-0.017	**<0.001**
Years diagnosed	0.001	0.000	0.001	0.002	**0.001**	0.001	0.000	0.000	0.002	**0.005**
Gender: Male	0.023	0.011	0.003	0.044	**0.028**	0.024	0.013	-0.002	0.051	0.072
Low/Med Adher	-0.020	0.010	-0.040	0.000	**0.049**	-0.022	0.014	-0.050	0.006	0.126
Underweight	-0.063	0.034	-0.128	0.003	0.061	-0.098	0.044	-0.183	-0.013	**0.024**
Exercise 0x/month	-0.017	0.011	-0.039	0.004	0.115	-0.043	0.013	-0.069	-0.016	**0.002**
Former smoker	-0.006	0.013	-0.032	0.020	0.653	-0.038	0.015	-0.067	-0.008	**0.012**
Drink alcohol	0.002	0.011	-0.019	0.023	0.848	0.030	0.014	0.003	0.057	**0.031**

Note. Generalized linear models with identity link functions were conducted. All predictors included: MMAS adherence (low/medium vs. complete), gender (male vs. female), ethnicity (non-Hispanic Black, Hispanic, other vs. non-Hispanic white), CCI, BMI (overweight, obese, unknown vs. normal weight), exercise (0 times per month vs. 1+ times per month), smoking status (former, current vs. never smoker), alcohol consumption (drink vs. don't drink), insurance (have vs. don't have), years diagnosed with epilepsy, and therapy (monotherapy vs. adjunctive therapy [2Rx+]).

LIMITATIONS

- Due to the self-reported design of the study, AED treatment and other data cannot be verified and data are subject to recall bias.
- Data are cross-sectional, causal explanations cannot be made.
- The epilepsy subpopulation may have been selectively underrepresented and may favor younger, healthier adults.

CONCLUSIONS

- In this retrospective analysis of a nationally representative survey, younger patients (<55 years old) had lower adherence to AEDs.
- For younger patients, lower adherence, smoking, obesity, greater comorbidity burden, and years since diagnosis of epilepsy are associated with poorer HRQoL (MCS and health utilities).
- Findings may be informative for clinicians deciding on treatments for younger patients as treatments that would garner higher adherence could potentially offer better HRQoL among this age group.

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DISCLOSURES

This study was funded by Sunovion Pharmaceuticals Inc.

68th American Academy of Neurology Annual Meeting, April 15–21 2016, Vancouver, BC, Canada