guidelines in 2017 than in 2014, but there remains room for improvement: 34.7% of products sold at the largest retailer do not meet recommendations. In addition, tanning and bronzing products continue to fail to meet AAD criteria.

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Cumulative oral corticosteroid use increases risk of glucocorticoid-related adverse events in patients with newly diagnosed pemphigus

To the Editor: Pemphigus is characterized by acquired autoantibodies to desmosomal cadherins. The only US Food and Drug Administration–approved treatment is corticosteroids (often given chronically at high doses).[1] Although mortality rates have declined with their use, corticosteroids are associated with serious dose-dependent complications.[2] To help physicians assess the risks of oral corticosteroid (OCS) treatment in this special patient population, we sought to quantify glucocorticoid-related adverse event (GAE) risk according to cumulative OCS exposure among patients with newly diagnosed pemphigus and to estimate the associated cost.

We conducted a retrospective cohort study with the use of Truven Health MarketScan administrative claims data. The study included patients ≥18 years of age with newly diagnosed (no diagnosis in 6 months before first observed) pemphigus, defined as ≥2 claims from July 1, 2010, to December 31, 2013, with ICD-9-CM code of 694.4[3] and OCS use 6 months before (baseline), to include empiric treatment, or after first diagnosis. Enrollment occurred during baseline and ≥1 year after first pemphigus diagnosis. On the basis of expert input and literature review,[4] 11 GAE categories were selected: cardiovascular events, opportunistic infection, cataract, osteoporosis, fracture, ulcer, aseptic necrosis, glaucoma, type 2 diabetes, psychosis, and hypertension. Chronic GAEs were counted if absent during baseline. We used Cox proportional hazards to estimate GAE risk with cumulative prednisone-equivalent grams exposure (updated daily from start of baseline) as the predictor variable. We adjusted for age, sex, and number of chronic conditions. Mean first-year costs were compared between patients with GAE and those without GAE through the use of *t* tests.

For the 644 patients included, mean age was 59.5 years and 56.1% were female (Table I). Mean total and daily OCS dose in the first year of follow-up was 3.9 g (median, 2.2 g) and 29.0 mg (median, 20.0 mg), respectively. The overall GAE rate was 0.46 events per patient-year. GAE risk increased per 1 g OCS exposure (hazard ratio [HR], 1.01; $P = .03$), as did the risk of cataract (HR, 1.02; $P < .001$) and fracture (HR, 1.01; $P = .03$) (Table II). The risks of infection, osteoporosis, necrosis of bone, psychosis, glaucoma, and diabetes were not statistically significantly associated with OCS. In the first follow-up year, patients with GAE compared with those without GAE had greater overall healthcare costs ($46,250 vs $24,962; $P < .001$), medical costs ($41,534 vs $21,528; $P = .002$), and outpatient pharmacy costs ($4716 vs $3433; $P = .018$).

Our results show that pemphigus patients with high OCS exposure have a greater risk of cataract and fracture. Each gram of OCS increases the risk of any GAE by 1%, risk of cataract by 2%, and risk of fracture by 1%. Previous studies in rheumatoid arthritis, asthma, and systemic lupus found similarly increased risks of fracture and cataracts as well as diabetes and infection.[5] Disease management that is focused on steroid-free remissions or lower cumulative OCS exposure may

Table I. Baseline characteristics

	All (n = 644)
Age, years, mean (SD)	59.5 (16.9)
18-49, n (%)	190 (29.5)
50-59, n (%)	145 (22.5)
60-69, n (%)	119 (18.5)
≥70, n (%)	190 (29.5)
Sex, n (%)	
Female	361 (56.1)
Plan type, n (%)	
Commercial	416 (64.6)
Medicare Supplemental*	228 (35.4)
Charlson Comorbidity Index, mean (SD)†	0.9 (1.6)
No. of chronic conditions, mean (SD)‡	2.7 (2.2)
Other autoimmune conditions, n (%)	65 (10.1)
Type 1 diabetes	39 (6.1)
Rheumatoid arthritis	15 (2.3)
Inflammatory bowel disease	12 (1.9)
Autoimmune thyroid disease	2 (0.3)
Myasthenia gravis	1 (0.2)
Total dose of OCS, mg, median (IQR, mg)§	210.0 (0.0-871.0)
Total days of supply of OCS, median (IQR, days)‖	10.0 (0.0-56.5)
Average daily dose of OCS, mg, median (IQR, mg)¶	11.9 (0.0-25.0)

Baseline characteristics were measured during 6 months before the index date.
IQR, Interquartile range; *OCS,* oral corticosteroids; *SD,* standard deviation.
*Medicare-eligible retirees with employer-sponsored Medicare Supplemental plans.
†Charlson Comorbidity Index range, 0-13.
‡Chronic Condition Indicator developed by the AHRQ HCUP.
§Mean (SD), 827.1 (2388.3).
‖Mean (SD), 35.3 (48.1).
¶Mean (SD), 19.0 (35.2).

reduce the detrimental effects observed. The mean first-year cost among patients with GAE was nearly double the costs for patients without GAE.

The lack of association with other GAEs could result from prophylactic treatment (eg, bisphosphonates for osteoporosis), small sample size, or true lack of association. Other limitations include the inability to account for differences in disease severity, no formal validation of the identification algorithm, inclusion of only newly diagnosed patients, and reliance on outpatient claims.

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Table II. Association between cumulative OCS exposure and risk of GAE

	Risk of GAE		Risk of cataract		Risk of fractures	
	HR (95% CI)	*P* value	HR (95% CI)	*P* value	HR (95% CI)	*P* value
Age, years						
50-59 vs 18-49	2.33 (1.68-3.23)	<.001	2.41 (1.18-4.92)	.016	1.77 (0.70-4.50)	.231
60-69 vs 18-49	2.95 (2.11-4.13)	<.001	4.71 (2.40-9.22)	<.001	3.31 (1.37-8.01)	.008
≥70 vs 18-49	4.40 (3.18-6.09)	<.001	4.29 (2.21-8.33)	<.001	5.53 (2.45-12.46)	<.001
Female vs male	1.07 (0.87-1.31)	.515	1.27 (0.88-1.83)	.203	1.83 (1.11-3.03)	.018
No. of chronic conditions*	1.00 (0.95-1.05)	.998	1.11 (1.02-1.21)	.012	1.02 (0.91-1.14)	.735
Cumulative exposure, per 1 g prednisone-equivalent dose	1.01 (1.00-1.02)	.029	1.02 (1.01-1.03)	<.001	1.01 (1.00-1.03)	.034

Cox proportional hazards regression was used to study the relationship between OCS exposure and GAE risk. Sample size for each model was 644. Cumulative OCS exposure was measured since the beginning of the 6-month baseline period and updated daily during follow-up. An increased risk of infection, osteoporosis, necrosis of bone, psychosis, glaucoma, and type 2 diabetes was observed but was not statistically significant.
CI, Confidence interval; *GAE,* glucocorticoid-related adverse event; *HR,* hazard ratio; *OCS,* oral corticosteroids.
*Chronic Condition Indicator was developed by the Agency for Healthcare Research and Quality's (AHRQ) Healthcare Cost and Utilization Project (HCUP).

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