The hidden costs of painful diabetic neuropathy revealed

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In this issue of *Neurology: Clinical Practice*, Kiyani et al.¹ have reported a significant increase in morbidity and health care costs among a large cohort of patients with painful diabetic neuropathy (pDPN). The objective of the study was to quantify the health care resources used in the care of patients with pDPN and to assess the risk of complications in this population. Patients with diabetes mellitus (DM) with or without incident diabetic neuropathy (DPN) over a 5-year period were identified using a large health care database. Those using neuropathic pain medications for 6 months before or 1 year after the index diagnosis were categorized as having pDPN. Health care costs were calculated for up to 5 years after diagnosis, and complications were queried. In total, 360,559 patients with DM were identified, of which 23% had pDPN and 4.8% had nonpainful DPN. Those with pDPN were 200% more likely to use opioids compared with DM controls and over 16 times more likely to have an amputation, and 2.2% had falls within 2 years, twice the rate of DM controls. The total median health care cost was \$16,795 in the first year after diagnosis, double that of DM controls. Patients with pDPN spent 3× as much on medications as DM controls. The highest median expenditure was \$5188 in year 1, compared with \$1727 among DM controls and \$2764 among those with nonpainful DPN. Accounting for confounders, the difference in costs persisted over the study period and widened over time.

Neurologic diseases are a major contributor to morbidity, and mortality is generally accepted. Neurologic diseases are the leading cause of disability in the world and the second leading cause of death, accounting for 16.8% of all global deaths in 2015, and their prevalence continues to rise.² However, most studies estimating the prevalence and burden of neurologic disease fail to include neuropathy, which contributes to a limited literature on neuropathy-associated morbidity and health care costs. Despite growing evidence, this indicates peripheral neuropathy is among the most common neurologic disorders. Among a middle-aged and elderly population, the prevalence of probable or definite neuropathy is 13%, a number that increases with age; those older than 80 years of age have a prevalence of >30%.³ Despite the high prevalence of peripheral neuropathy, patients often do not undergo an evidence-based evaluation,⁴ and many have unnecessary diagnostic tests that contribute to the significant health care costs reported by Kiyani et al.¹ In 1 study of a Medicare population, 88% of total expenditures attributable to neuropathy were for MRIs and electrodiagnostic tests. The most common location scanned was the brain (32% of neuropathy patients had a brain MRI). Although nerve conduction studies and electromyography play a critical role in the evaluation of suspected peripheral nerve disorders, these tests infrequently alter management of patients with suspected neuropathy. Not surprisingly, MRI also rarely affects neuropathy patient care.⁴ Although expensive and often unnecessary imaging studies are commonly ordered, evidence-based diagnostic tests are only performed in a minority of patients. Only 24% of patients have a serum protein electrophoresis ordered and less than half have their vitamin B12 level checked,⁵ both guideline-recommended tests.⁶

One of the more striking, if not unsurprising, findings from this study is the marked increase in opioid prescriptions among patients with painful neuropathy: 72% of patients with pDPN had at least 1 opioid prescription. This is consistent with a recent retrospective study of a large cohort of patients with peripheral neuropathy which found that over 60% were treated with at least 1 opioid

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and >8% were treated with chronic opioids. Only 35% were treated with at least 1 guideline-recommended agent.⁷

This study has several weaknesses including the reliance on International Classification of Diseases, Ninth Revision codes for diagnosis and definition of pDPN. Neuropathy is likely under coded; thus, it is probable that a large percentage of patients with nonpainful DPN were categorized as DPN controls. Given 50% of patients with DM have neuropathy, the fact that only 4.8% of this cohort had nonpainful DPN suggests most neuropathy patients were included in the DM control group. Assuming this is the case, the analysis likely underestimated the morbidity and health care costs attributable to nonpainful DPN and, by including these patients in the control group, underestimated the incremental cost of pDPN relative to patients with DM without neuropathy. The only morbidities examined were amputations, lower extremity infections, and falls and fall-related injuries. Other symptoms that significantly affect quality of life were not evaluated including depression, anxiety, and sleep disturbance, each of which are highly prevalent among patients with pDPN.⁸ Patients with anxiety or depression are significantly more likely to be treated with chronic opioids.⁷ In addition, pDPN was defined based on use of predefined neuropathic pain medications regardless of pain etiology or symptomatology, which may have captured patients with nonDPN-related discomfort and omitted patients treated with other pain medications or nontraditional methods (e.g., acupuncture). These weaknesses do not lessen the importance of this study, and each suggests the true impact and cost of pDPN may be higher than that estimated here.

Given the numerous negative and expensive health consequences attributable to pDPN, it is critically important that health care providers recognize and appropriately evaluate and manage these patients using evidence-based diagnostic testing and pharmacologic and nonpharmacologic therapies including lifestyle-based diet and exercise management strategies.⁹ This objective is particularly relevant in the context of the current opioid epidemic. The National Institutes of Health and other funding agencies should support studies that aim to identify

effective pDPN-preventative and therapeutic strategies, and professional organizations including the American Academy of Neurology should continue efforts to educate the general medical community on the impact of pDPN and appropriate testing and treatment approaches. Kiyani et al.¹ should be congratulated for reminding the neurology community of the significant morbidity and cost of pDPN.

Author contributions

A.G. Smith and S. Živković: drafting and revising the manuscript.

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References

1. Kiyani M, Yang Z, Charalambous LT, et al. Painful diabetic peripheral neuropathy: health care costs and complications from 2010 to 2015. *Neurol Clin Pract* 2019;10: 47–57.
2. Global regional and national burden of neurological disorders during 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet Neurol* 2017;16:877–897.
3. Hanewinkel R, Drenthen J, van Oijen M, Hofman A, van Doorn PA, Ikram MA. Prevalence of polyneuropathy in the general middle-aged and elderly population. *Neurology* 2016;87:1892–1898.
4. Callaghan BC, Kerber KA, Lisabeth LL, et al. Role of neurologists and diagnostic tests on the management of distal symmetric polyneuropathy. *JAMA Neurol* 2014;71:1143–1149.
5. Callaghan BC, Burke JF, Rodgers A, et al. Expenditures in the elderly with peripheral neuropathy: where should we focus cost-control efforts? *Neurol Clin Pract* 2013;3:421–430.
6. England JD, Gronseth GS, Franklin G, et al. Practice parameter: the evaluation of distal symmetric polyneuropathy: the role of autonomic testing, nerve biopsy, and skin biopsy (an evidence-based review). Report of the American Academy of Neurology, the American Association of Neuromuscular and Electrodiagnostic Medicine; American Academy of Physical Medicine and Rehabilitation. *Neurology* 2009;72: 177–184.
7. Callaghan BC, Reynolds E, Banerjee M, Kerber KA, Skolarus LE, Burke JF. Longitudinal pattern of pain medication utilization in peripheral neuropathy patients. *Pain* 2019;160:592–599.
8. Bai JW, Lovblom LE, Cardinez M, et al. Neuropathy and presence of emotional distress and depression in longstanding diabetes: results from the Canadian study of longevity in type 1 diabetes. *J Diabetes Complications* 2017;31:1318–1324.
9. Stino AM, Smith AG. Peripheral neuropathy in prediabetes and the metabolic syndrome. *J Diabetes Investig* 2017;8:646–655.