American Podiatric Surgeons' Postoperative Multimodal Analgesic-Prescribing Practice

A 2019–2020 National Survey

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Background: Surgery is a common setting for opioid-naive patients to first be exposed to opioids. Understanding the multimodal analgesic-prescribing habits of podiatric surgeons in the United States may be helpful to refining prescribing protocols. The purpose of this benchmark study was to identify whether certain demographic characteristics of podiatric surgeons were associated with their postoperative multimodal analgesic-prescribing practices.

Methods: We administered a scenario-based, voluntary, anonymous, online questionnaire that consisted of patient scenarios with a unique podiatric surgery followed by a demographics section. We developed multiple logistic regression models to identify associations between prescriber characteristics and the odds of supplementing with a nonsteroidal anti-inflammatory drug, regional nerve block, and anticonvulsant agent for each scenario. We developed multiple linear regression models to identify the association of multimodal analgesic-prescribing habits and the opioid dosage units prescribed at the time of surgery.

Results: Eight hundred sixty podiatric surgeons completed the survey. Years in practice was a statistically significant variable in multiple scenarios. Compared with those in practice for more than 15 years, podiatric surgeons in practice 5 years or less had increased odds of reporting supplementation with an anticonvulsant agent in scenarios 1 (odds ratio [OR], 2.4; 95% confidence interval [CI], 1.11–5.18; $P = .03$), 3 (OR, 2.97; 95% CI, 1.55–5.68; $P = .001$), 4 (OR, 2.54; 95% CI, 1.56–4.12; $P < .001$), and 5 (OR, 2.07; 95% CI, 1.29–3.32; $P = .003$).

Conclusions: Podiatric surgeons with fewer years in practice had increased odds of supplementing with an anticonvulsant. Approximately one-third of podiatric surgeons reported using some form of a nonopioid analgesic and an opioid in every scenario. The use of multimodal analgesics was associated with a reduction in the number of opioid dosage units prescribed at the time of surgery and may be a reasonable adjunct to current protocols. (J Am Podiatr Med Assoc 113(4), 2023)

There is increased recognition that governmental agencies, patients, pharmaceutical companies, and clinicians all contribute to the US opioid epidemic.[1-5] These same parties can make meaningful contributions to resolve the epidemic by identifying ineffective habits and encouraging change.[1-3] Surgery is a common setting for opioid-naive people to first be exposed to opioids.[6] From July 2016 to June 2017, surgeons prescribed more than 10.8% of the 209.5 million opioid prescriptions in the United States.[7] Musculoskeletal surgeons in particular have been targeted as major contributors to opioid prescribing due to these procedures being associated with often severe levels of postoperative

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pain.[8] Not surprisingly, musculoskeletal surgeons have been reported to be responsible for more than half of the prescriptions given by all surgeons.[7] Recent efforts have been made to establish guidelines for surgeons regarding opioid dispensing for common surgical procedures, and shifting toward a multimodal analgesic approach when possible.[6,8] The use of multimodal analgesics can reduce the need for opioid consumption during the postoperative period.[8-10] In addition, a multimodal analgesic approach can produce superior analgesia over an opioid-only approach by targeting a variety of pain pathways.[8],[9],[11-14]

Understanding the multimodal analgesic-prescribing habits of podiatric surgeons in the United States may be helpful to refining prescribing protocols with the aim of effectively controlling postoperative pain and minimizing unused opioid distribution after foot and ankle surgery.[14,16] The purpose of this study was to evaluate the current hypothetical use of multimodal analgesic approaches for postoperative pain management among podiatric surgeons. We believe that there will be a variation in postoperative protocols based on previous work, where less experienced foot and ankle surgeons will have higher odds of supplementing postoperative opioids with nonopioid analgesics compared with more experienced surgeons (in practice >15 years).[1,17] In addition, we aimed to identify whether certain demographic characteristics of podiatric surgeons were associated with their postoperative multimodal analgesic-prescribing practices.

Methods

Research Design

This study was based on a previously published survey by Hearty et al[17] in 2018 consisting of four rearfoot and ankle scenarios and 31 questions and described the prescribing habits of orthopedic foot and ankle surgeons. The data from the present study were originally part of a larger study by Brooks et al,[1] but it was not previously published; a decision a posteriori to break up the original study into multiple studies was made by the authors given the relatively large size of the data and the admittedly ambitious scope of the original study. We received exempt status from the Committee for the Protection of Human Subjects at Dartmouth College (Hanover, New Hampshire) and the institutional review board at the Rosalind Franklin University of Medicine and Science (North Chicago, Illinois) for an open, voluntary, anonymous, online questionnaire distributed on the Internet via Qualtrics, an online survey platform that uses panel-based sampling to reach specific demographic groups (Qualtrics, Seattle, Washington). No personal or identifiable information was stored. Respondents received no incentive for survey completion, and they could use a back button to revisit their answers. We modified and improved on the previous survey by Hearty et al[17] by including additional questions, an in-office procedure scenario, and a forefoot surgery scenario (Appendix 1). Additional questions included data regarding opioid choice and number of “pills” (dosage units) dispensed for the purpose of reporting prescribing habits, as well as additional questions regarding prescriber characteristics. Given the nature of the in-office procedure scenario, we made an a posteriori decision to report it in a separate study; consequently, we renumbered the scenarios reported in this study. Content validity was established through an extensive review of the literature in September 2018 and by the members of the 2019–2020 Clinical Practice Advisory Committee of the American Podiatric Medical Association (APMA), who served as content experts and offered input on each patient scenario and on commonly prescribed postoperative pain medications in foot and ankle surgery. We completed the pilot study in October 2019. This study adhered to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES), found in Appendix 2.

Sample and Population

The target population was practicing podiatric surgeons in the United States. We recruited practicing podiatric surgeons exclusively through e-mail invitation from the APMA membership list, which consisted of approximately 8,736 members who fit the eligibility criteria. Retired podiatric surgeons, podiatric physicians who no longer perform surgery, current fellows, and residents were excluded. Survey respondents who did not complete the demographics section, which was at the end of the questionnaire, were also excluded from the analysis.

The Survey

Eight survey invitations were sent via e-mail from December 10, 2019, to April 10, 2020. In the consent statement provided at the beginning of the survey, participants were asked to respond to the questionnaire only once. The survey took an estimated 10 to

15 min to complete. Respondents were presented with five different scenarios. For each scenario, respondents were then provided six multiple-choice options regarding which postoperative medication they would prescribe. Respondents were also provided multiple-choice responses for the common schedules and doses of the prescribed medication and asked to complete a fill-in-the-blank response for the number of "pills" (dosage units) prescribed at the time of surgery. Dichotomous options for supplementing with a nonsteroidal anti-inflammatory drug (NSAID), regional nerve block, and anticonvulsant agent were provided. We collected the following demographic information: gender identity, years in practice, podiatric medical school, years of residency, completion of a fellowship, practice setting, and the US state in which each respondent primarily practiced. States were then reclassified into the US Census regions (Midwest, Northeast, South, and West), with Puerto Rico classified in the South region.

Variables of Interest

There were four dependent variables: three (supplementation with an NSAID, use of a regional nerve block, and supplementation with an anticonvulsant agent) were dichotomous and one (opioid dosage units prescribed at the time of surgery) was continuous. An a priori decision was made to exclude podiatric surgeons who opted to prescribe nonopioids at the time of surgery from the analysis. The most common (mode) opioid prescribed overall was also reported.

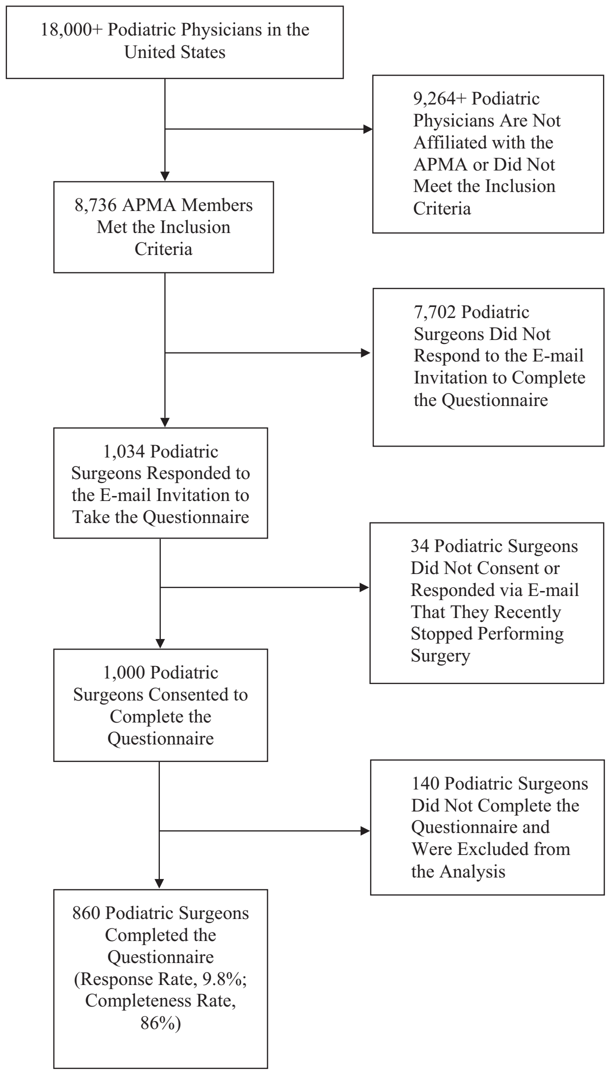
Statistical Analysis

Unweighted responses were analyzed. Linear and multiple logistic regression models were used to understand the strength and direction of the association between the outcome variables and independent variables. All of the assumptions were tested and met. We analyzed the data using R v4.0.3 (The R Foundation, Boston, Massachusetts). A predefined alpha level of 0.05 or less was used for statistical significance, and only completed surveys were analyzed.

Results

Descriptive Results

The survey included 860 podiatric surgeons, which resulted in a completeness rate of 86% and a response rate of 9.8% (Fig. 1), or approximately 5% of the total practicing podiatric physicians in the United States. Approximately 11% of respondents completed a 1- to 2-year fellowship program after residency. The most commonly prescribed opioid in scenarios 1 through 3 was hydrocodone, and oxycodone was more commonly prescribed in scenarios 4 and 5. Thirty-one percent of podiatric surgeons reported that they would use a multimodal approach in their postoperative protocols for all five scenarios (Table 1). A breakdown of the percentage of multimodal analgesics given by respondents who opted for a multimodal analgesic approach is given in Table 2; regional nerve blocks were the most common nonopioid analgesics used by podiatric surgeons across all scenarios.



APMA, American Podiatric Medical Association.

Figure 1. Representation of response rate and completeness rate.

Table 1. Postoperative Pain Management Approach Used by Opioid Prescribers for Each Scenario

Scenario No.: Procedure	Approach (%)	
	Opioid Only	Multimodal
1: First metatarsal osteotomy (Austin bunionectomy)	41	59
2: Open Brostrom-Gould repair	39	61
3: Open reduction and internal fixation of a closed bimalleolar ankle fracture	43	57
4: Tibiotalocalcaneal arthrodesis	49	51
5: Total ankle arthroplasty with Tendo Achilles lengthening	42	58
All procedures	69	31
Any procedure	18	82

Table 2. Analgesics Given by Respondents Who Reported Using a Multimodal Approach

Patient's Opioid History	Scenario No.: Procedure	Analgesics (%)		
		Regional Nerve Block	NSAID	Anticonvulsant Agent
Opioid naive	1: First metatarsal osteotomy (Austin bunionectomy)	79	71	8
Opioid naive	2: Open Brostrom-Gould repair	78	73	9
Opioid naive	3: ORIF of a closed bimalleolar ankle fracture	76	70	10
Occasional opioid use	4: Tibiotalocalcaneal arthrodesis	71	52	27
Daily opioid use	5: Total ankle arthroplasty with Tendo Achilles lengthening	72	63	28

Abbreviations: NSAID, nonsteroidal anti-inflammatory drug; ORIF, open reduction and internal fixation.

Statistical Analysis

The collective results from the statistical analyses appear in Tables 3 and 4. Individual scenario results also appear below.

Scenario 1: First Metatarsal Osteotomy (Austin Bunionectomy). Female sex was associated with a decreased likelihood (odds ratio [OR], 0.44; 95% confidence interval [CI], 0.22–0.90; $P = .02$) of supplementing with an anticonvulsant agent. Compared with practicing for greater than 15 years, practicing for 5 years or less (OR, 2.4; 95% CI, 1.11–5.18; $P = .03$) and practicing for 6 to 15 years (OR, 2.54; 95% CI, 1.32–4.85; $P = .005$) were associated with increases in the odds of supplementing with an anticonvulsant agent.

Scenario 2: Open Brostrom-Gould Repair. Compared with practicing for greater than 15 years, practicing for 5 years or less (OR, 3.12; 95% CI, 1.47–6.62; $P = .003$) and practicing for 6 to 15 years (OR, 1.79; 95% CI, 1.06–3.04; $P = .031$) were associated with increases in the odds of supplementing with a regional nerve block. Completing a fellowship (OR, 0.49; 95% CI, 0.28–0.87; $P = .015$) was associated with decreased odds of supplementing with a regional nerve block.

Female sex (OR, 1.76; 95% CI, 1.13–2.74; $P = .01$) was associated with an increase in the odds of supplementing with an NSAID. Compared with practicing for greater than 15 years, practicing for 6 to 15 years (OR, 2.48; 95% CI, 1.31–4.70; $P = .005$) was associated with an increase in the odds of supplementing with an anticonvulsant agent. Compared with affiliation with a private practice, affiliation with a federal health system (OR, 3.03; 95% CI, 1.17–7.83; $P = .02$) was associated with an increase in the odds of supplementing with an anticonvulsant agent. Completing a fellowship (estimate, 3.82; 95% CI, 1.61–6.04; $P = .001$), practicing for 5 years or less (estimate, 3.34; 95% CI, 1.27–5.42; $P = .002$), and practicing for 6 to 15 years (estimate, 4.44; 95% CI, 2.67–6.21; $P < .001$) were associated with an increase in the number of opioid dosage units prescribed at the time of surgery. Supplementing with an NSAID (estimate, –2.46; 95% CI, –3.92 to –0.99; $P = .001$) was associated with a decrease in the number of opioid dosage units prescribed.

Scenario 3: Open Reduction and Internal Fixation of a Closed Bimalleolar Ankle Fracture. Female sex (OR, 2.95; 95% CI, 1.67–5.22; $P < .001$) and practicing for 6 to 15 years (OR, 2.94; 95% CI, 1.65–5.22; $P < .001$) were associated with an increase in the odds of using a regional nerve block.

Compared with practicing for greater than 15 years, practicing for 5 years or less (OR, 2.97; 95% CI, 1.55–5.68; $P = .001$) and for 6 to 15 years (OR, 2.34; 95% CI, 1.32–4.15; $P = .004$) were associated with an increase in the odds of supplementing with an anticonvulsant agent. Compared with those

Table 3. Adjusted Logistic Regression Models for Supplementing with a Nonopioid (Regional Nerve Block, NSAID, Anticonvulsant) Among Opioid Prescribers

	Nerve Block			NSAID			Anticonvulsant Agent		
Predictor	Odds Ratio	95% CI	*P* Value	Odds Ratio	95% CI	*P* Value	Odds Ratio	95% CI	*P* Value
Scenario 1									
Sex									
Male (referent)									
Female	0.71	0.47–1.08	.106	1.3	0.87–1.93	.197	0.44	0.22–0.90	.023[a]
Region									
Midwest (referent)									
Northeast	0.63	0.34–1.16	.135	0.95	0.54–1.66	.856	0.54	0.19–1.48	.231
South	1.25	0.73–2.15	.41	0.72	0.46–1.12	.147	0.87	0.40–1.89	.722
West	0.67	0.37–1.21	.185	0.66	0.38–1.13	.132	1.33	0.56–3.15	.521
Completed fellowship	0.67	0.40–1.15	.146	1.02	0.60–1.72	.948	1.91	0.93–3.91	.077
Years in practice									
>15 (referent)									
≤5	0.67	0.39–1.15	.147	1.22	0.72–2.07	.459	2.4	1.11–5.18	.026[a]
6–15	0.79	0.49–1.26	.321	0.93	0.61–1.41	.719	2.54	1.32–4.85	.005[a]
Practice environment									
Private practice (referent)									
Academic	0.63	0.26–1.52	.305	1.05	0.45–2.45	.911	0	NA	.748
Federal	3.64	0.83–15.88	.086	0.61	0.28–1.34	.222	1.84	0.66–5.11	.24
Hospital/health system	0.79	0.45–1.41	.429	1.4	0.78–2.50	.26	1.89	0.90–3.96	.092
Scenario 2									
Sex									
Male (referent)									
Female	1.15	0.72–1.84	.56	1.76	1.13–2.74	.013[a]	0.73	0.39–1.36	.326
Region									
Midwest (referent)									
Northeast	1.22	0.63–2.37	.546	1.17	0.63–2.15	.616	0.54	0.20–1.47	.228
South	1.37	0.80–2.34	.246	0.76	0.48–1.21	.25	0.67	0.30–1.49	.324
West	0.6	0.33–1.09	.095	0.76	0.43–1.36	.362	1.71	0.75–3.92	.204
Completed fellowship	0.49	0.28–0.87	.015[a]	1.12	0.63–2.00	.69	1.63	0.80–3.31	.179
Years in practice									
>15 (referent)									
≤5	3.12	1.47–6.62	.003[a]	1.51	0.84–2.69	.167	1.89	0.85–4.21	.12
6–15	1.79	1.06–3.04	.031[a]	1.09	0.70–1.71	.701	2.48	1.31–4.70	.005[a]
Practice environment									
Private practice (referent)									
Academic	3.72	0.84–16.48	.084	1.63	0.60–4.42	.335	0.63	0.13–3.06	.562
Federal	1.28	0.45–3.62	.64	0.51	0.23–1.12	.094	3.03	1.17–7.83	.022[a]
Hospital/health system	1.48	0.74–2.97	.272	1.51	0.79–2.86	.211	1.74	0.81–3.70	.153
Scenario 3									
Sex									
Male (referent)									
Female	2.95	1.67–5.22	<.001[a]	1.06	0.72–1.56	.769	0.9	0.53–1.52	.692
Region									
Midwest (referent)									
Northeast	0.94	0.50–1.76	.846	0.97	0.55–1.72	.913	1	0.43–2.29	.994
South	1.27	0.74–2.17	.394	0.64	0.41–1.01	.053	0.89	0.44–1.80	.746
West	1.11	0.57–2.15	.761	0.84	0.48–1.47	.541	1.34	0.61–2.94	.462
Completed fellowship	0.79	0.42–1.50	.474	0.85	0.51–1.41	.533	1.54	0.82–2.87	.176
Years in practice									
>15 (referent)									
≤5	6.46	3.93–9.93	.146	0.83	0.50–1.38	.48	2.97	1.55–5.68	.001[a]
6–15	2.94	1.65–5.22	<.001[a]	0.97	0.63–1.49	.891	2.34	1.32–4.15	.004[a]
Practice environment									
Private practice (referent)									
Academic	1.9	0.61–5.85	.266	0.68	0.30–1.51	.339	0.74	0.20–2.74	.653
Federal	0.73	0.26–2.04	.548	0.49	0.23–1.07	.072	1.26	0.45–3.56	.659
Hospital/health system	1.6	0.74–3.45	.228	1.11	0.63–1.95	.722	1.98	1.03–3.81	.04[a]

Table 3. continued

Predictor	Nerve Block			NSAID			Anticonvulsant Agent		
	Odds Ratio	95% CI	*P* Value	Odds Ratio	95% CI	*P* Value	Odds Ratio	95% CI	*P* Value
Scenario 4									
Sex									
Male (referent)									
Female	1.9	1.16–3.12	.011[a]	1.1	0.77–1.57	.612	1.17	0.79–1.72	.431
Region									
Midwest (referent)									
Northeast	0.8	0.44–1.47	.478	1.16	0.68–1.96	.584	0.95	0.53–1.69	.861
South	1.32	0.78–2.22	.298	0.56	0.37–0.85	.007[a]	1.17	0.72–1.89	.534
West	0.94	0.50–1.80	.862	0.7	0.42–1.16	.165	1.21	0.67–2.18	.518
Completed fellowship	0.78	0.43–1.41	.411	0.87	0.55–1.40	.572	1.31	0.80–2.15	.288
Years in practice									
>15 (referent)									
≤5	6.63	2.86–15.35	<.001[a]	0.85	0.53–1.36	.499	2.54	1.56–4.12	<.001[a]
6–15	4.23	2.35–7.62	<.001[a]	0.87	0.59–1.28	.467	1.44	0.95–2.19	.087
Practice environment									
Private practice (referent)									
Academic	1.81	0.64–5.09	.261	0.64	0.29–1.38	.251	2.07	0.92–4.68	.079
Federal	1.69	0.54–5.31	.367	1.08	0.49–2.36	.846	1.16	0.51–2.64	.717
Hospital/health system	2.18	1.02–4.64	.043[a]	1.22	0.73–2.01	.448	1.76	1.04–2.96	.034[a]
Scenario 5									
Sex									
Male (referent)									
Female	2.82	1.54–5.15	.001[a]	1.21	0.81–1.80	.354	1	0.68–1.45	.981
Region									
Midwest (referent)									
Northeast	0.97	0.50–1.85	.918	1.38	0.77–2.47	.28	0.97	0.56–1.69	.92
South	1.42	0.81–2.49	.227	0.77	0.49–1.21	.261	0.96	0.60–1.52	.857
West	1.13	0.56–2.28	.729	1.06	0.60–1.86	.838	1.45	0.84–2.50	.176
Completed fellowship	0.48	0.26–0.91	.025[a]	0.71	0.42–1.18	.184	1.02	0.62–1.69	.927
Years in practice									
>15 (referent)									
≤5	20	4.76–84.02	<.001[a]	0.93	0.56–1.56	.79	2.07	1.29–3.32	.003[a]
6–15	8.68	3.89–19.39	<.001[a]	0.81	0.53–1.23	.318	1.29	0.86–1.95	.216
Practice environment									
Private practice (referent)									
Academic	2.28	0.72–7.28	.163	0.69	0.31–1.54	.361	1.81	0.81–4.03	.15
Federal	2.11	0.56–7.93	.268	0.83	0.37–1.85	.643	1.36	0.62–3.00	.444
Hospital/health system	2.99	1.20–7.42	.018[a]	1.89	1.03–3.47	.041[a]	1.57	0.94–2.62	.086

Abbreviations: CI, confidence interval; NA, not available; NSAID, nonsteroidal anti-inflammatory drug.
[a]Statistically significant.

affiliated with a private practice, being affiliated with a hospital/health system (OR, 1.98; 95% CI, 1.03–3.81; *P* = .04) was associated with an increase in the odds of supplementing with an anticonvulsant agent. Completing a fellowship (estimate, 3.58; 95% CI, 1.43–5.72; *P* = .001), practicing for 5 years or less (estimate, 3.06; 95% CI, 0.92–5.20; *P* = .005), and practicing for 6 to 15 years (estimate, 4.44; 95% CI, 2.68–6.19; *P* < .001) were associated with an increase in the number of opioid dosage units prescribed at the time of surgery.

Scenario 4: Tibiotalocalcaneal Arthrodesis with Tendo Achilles Lengthening. Female sex (OR, 1.9; 95% CI, 1.16–3.12; *P* = .011), practicing for 6 to 15 years (OR, 4.23; 95% CI, 2.35–7.62; *P* < .001), and working in a hospital/health system (OR, 2.18; 95% CI, 1.02–4.64; *P* = .04) were associated with an increase in the odds of supplementing with a regional nerve block. Compared with living in the Midwest, living in the South (OR, 0.56; 95% CI, 0.37–0.85; *P* = .007) was associated with a decrease in the odds of supplementing with an NSAID. Practicing for 5 years or less (OR, 2.54; 95% CI, 1.56–4.12; *P* < .001) and working for a hospital/health system (OR, 1.76; 95% CI, 1.04–2.96; *P* = .034) were associated with an increase in the odds of supplementing with an anticonvulsant agent. Supplementing with a nerve block (estimate, –3.66;

Table 4. Adjusted Linear Regression Model for Opioid Dosage Units Prescribed at the Time of Surgery

Scenario	Predictors	Intercept	Supplements with "x"[a]		
			Regional Nerve Block	NSAID	Anticonvulsant Agent
Scenario 1	Estimate	23.67	0.59	–2.46	–0.52
	95% CI	21.32 to 26.02	–1.09 to 2.28	–3.92 to –0.99	–3.25 to 2.21
	P value	<.001[b]	.49	.001[b]	.707
Scenario 2	Estimate	23.98	–0.38	–0.3	0.03
	95% CI	21.50 to 26.46	–2.17 to 1.42	–1.91 to 1.31	–2.55 to 2.61
	P value	<.001[b]	.679	.712	.981
Scenario 3	Estimate	32.15	–3.66	–3.58	–2.18
	95% CI	27.53 to 36.77	–7.01 to –0.30	–6.51 to –0.65	–6.48 to 2.12
	P value	<.001[b]	.033[b]	.017[b]	.319
Scenario 4	Estimate	27.71	0.64	–1.83	–1.14
	95% CI	25.18 to 30.25	–1.36 to 2.63	–3.50 to –0.16	–3.01 to 0.74
	P value	<.001[b]	.531	.032[b]	.234
Scenario 5	Estimate	29.19	–0.23	–1.41	–1.02
	95% CI	26.12 to 32.26	–2.64 to 2.18	–3.47 to 0.64	–3.03 to 0.99
	P value	<.001[b]	.852	.178	.32

Abbreviations: CI, confidence interval; NSAID, nonsteroidal anti-inflammatory drug.
[a]This model also adjusted for sex, practice region, fellowship training, years in practice, and practice environment.
[b]Statistically significant.

95% CI, –7.01 to –0.30; *P* = .033) and supplementing with an NSAID (estimate, –3.58; 95% CI, –6.51 to –0.65; *P* = .017) were associated with decreases in opioid dosage units prescribed at the time of surgery.

Scenario 5: Total Ankle Arthroplasty with Tendo Achilles Lengthening. Female sex (OR, 2.82; 95% CI, 1.54–5.15; *P* = .001) and working for a hospital/health system (OR, 2.99; 95% CI, 1.20–7.42; *P* = .018) were associated with an increase in the odds of supplementing with a regional nerve block. Compared with being in a private practice, working for a hospital/health system (OR, 1.89; 95% CI, 1.03–3.47; *P* = .041) was associated with an increase in the odds of supplementing with an NSAID. Compared with practicing for greater than 15 years, practicing for 5 years or less (OR, 2.07; 95% CI, 1.29–3.32; *P* = .003) was associated with an increase in the odds of supplementing with an anticonvulsant agent. Practicing for 6 to 15 years (estimate, 2.47; 95% CI, 0.32–4.61; *P* = .024) was associated with an increase in opioid dosage units prescribed. Supplementing with an NSAID (estimate, –1.83; 95% CI, –3.50 to –0.16; *P* = .032) was associated with a decrease in opioid dosage units prescribed at the time of surgery. Completing a fellowship (estimate, 2.54; 95% CI, 0.99–6.65; *P* = .038) and practicing for 6 to 15 years (estimate, 2.54; 95% CI, 0.15–4.94; *P* = .038) were associated with an increase in opioid dosage units prescribed.

Discussion

In this national cross-sectional study of 860 podiatric surgeons, approximately 82% of podiatric surgeons used some form of a multimodal postoperative protocol. Regional nerve blocks were the most common nonopioid form of analgesia given by respondents, followed by NSAIDs, and then anticonvulsant agents (Table 2). Across multiple scenarios, the use of multimodal analgesics resulted in fewer opioids being dispensed postoperatively; however, statistical significance was achieved only four times (in three of the five scenarios). The use of NSAIDs was associated with significantly fewer opioids being prescribed at the time of surgery three of the aforementioned four times (Table 4). Use of an NSAID was reported highest in the sole nonosseous surgery (scenario 2). Although NSAID use has led to bone-healing complications in animal models and in vitro studies, Hassan and Karlock[17] demonstrated, in a retrospective cohort study, that short-term postoperative NSAID use had no statistically significant difference in osseous nonunion outcomes in elective foot and ankle surgery.

Proper postoperative pain management considers a patient's opioid history. In this present study, the two scenarios that included non–opioid-naive patients (scenarios 4 and 5) saw an increase in supplementing with an anticonvulsant agent (ie, gabapentin, pregabalin) while simultaneously seeing a decrease in NSAIDs prescribed (Table 2). Note that anticonvulsant agents are not without an addiction risk of their own.[18] The principal population at risk for addiction consists of patients with other current or past substance use disorders, mostly opioid and multidrug users.[18] Pregabalin seems to be somewhat more addictive than gabapentin.[18] Overdoses of these drugs can become lethal in mixture with opioids and sedatives.[18] Bonnet and Scherbaum[18] recommended that in patients with a history of substance use disorders, gabapentin and pregabalin should be avoided or, if indispensable, administered with caution by using strict therapeutic and prescription monitoring.

Prescribing protocols in foot and ankle surgery should aim to effectively control postoperative pain and minimize unused opioid distribution. Potentially reducing the length of stay in a hospital is another benefit. Although it is well-known that multimodal analgesics can help achieve these goals,[8,9] the mere use of any multimodal approach does not guarantee improved outcomes.[19] In a prospective, double-blind, randomized controlled trial, Hancock et al[19] examined the efficacy of analgesic injections in closed rotational ankle fractures that were treated operatively. The injection group was noted to have lower mean pain scores for the first 24 and 48 hours; however, there was no significant reduction in opioid consumption, meaningful reduction in pain levels, or length of stay in the hospital.[19] Although not a direct comparison, in the present study, regional nerve blocks and NSAIDs were associated in a reduction of opioid dosage units prescribed at the time of surgery in the open reduction and internal fixation of a closed bimalleolar ankle fracture scenario (scenario 3). Furthermore, in a retrospective study, Michelson et al[20] noted favorable outcomes with a pain protocol for patients who underwent foot and ankle surgery by using a preoperative multimodal regimen of an opioid, an NSAID, an anticonvulsant agent, acetaminophen, and prednisone followed by a postoperative regimen of opioids, NSAIDs, and acetaminophen.[20,21] Patients who received the aforementioned multimodal analgesic protocol did, unlike in the study by Hancock et al,[19] have a shorter length of stay regardless of the complexity of the foot and ankle surgery.[20,21]

The present study expanded on previous work by Hearty et al.[17] Hearty et al's questionnaire-based cross-sectional study (n = 64) examined the association between prescriber characteristics and postoperative pain management prescribing practice among orthopedic foot and ankle surgeons. Hearty et al[17] demonstrated that less experienced orthopedic surgeons tended to supplement with regional nerve blocks more than experienced surgeons. In the present study, less experienced podiatric surgeons (ie, those in practice ≤5 years and 6–15 years) were more likely to supplement their postoperative opioid prescriptions with an NSAID, regional nerve block, or anticonvulsant agent in multiple scenarios. This similarity between less experienced orthopedic and podiatric surgeons may highlight another area of needed education for foot and ankle surgeons based on their years in practice.

This study has several limitations. We presented hypothetical situations and asked podiatric surgeons what they would expect to prescribe for each scenario. As such, we did not obtain data regarding actual prescribing habits, and there may be variation between what prescribers say they will prescribe versus what they actually prescribe. In addition, the use of acetaminophen, cannabidiol, and other analgesics was not included in or captured by this study. Although the APMA is a large organization, its membership may not accurately serve as a proxy for the entire podiatric surgeon population in the United States; thousands of podiatric surgeons are not members of the APMA. Furthermore, this study had a 9.8% response rate (n = 860), which is an improvement on previous research with much lower sample sizes; however, low overall response rates make it difficult to generalize findings to all podiatric surgeons practicing in the United States.

Conclusions

Postoperative multimodal analgesic-prescribing practice variation exists in foot and ankle surgery. Podiatric surgeons with fewer years in practice had increased odds of supplementing with an anticonvulsant agent. One-third of all podiatric surgeons reported that they would use an NSAID, a regional nerve block, and/or an anticonvulsant agent as well as an opioid for postoperative pain management for all foot and ankle surgeries. The use of multimodal analgesics tended to be associated with reductions in the number of opioid dosage units prescribed at the time of surgery and may be a reasonable adjunct to current protocols. Hydrocodone was the most common opioid of choice prescribed by podiatric surgeons for opioid-naive patients; for non–opioid-naive patients, oxycodone surpassed hydrocodone as the opioid of choice. Regardless of the foot and ankle surgery, regional nerve blocks were the most common nonopioid analgesic used by podiatric surgeons. Further research is needed to determine the impact of a multimodal analgesic approach on opioid prescribing and consumption in a prospective cohort of patients after foot and ankle surgery.

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Appendix 1. Patient Scenarios

Scenario 1 Procedure: First Metatarsal Osteotomy (Austin Bunionectomy)

"[A] 45-year-old woman has worsening bunion pain and can no longer tolerate her usual shoes; otherwise healthy. Conservative care has not been successful. She takes ibuprofen as needed for the pain and has never taken opioid pain medication. Radiographs reveal an intermetatarsal angle of 13°."

Scenario 2 Procedure: Open Brostrom-Gould Repair

"[A] 20-year-old man has lateral ankle instability after sustaining multiple ankle sprains; otherwise healthy. He is a manual laborer. He takes ibuprofen as needed for the pain and has never taken opioid pain medication."

Scenario 3 Procedure: Open Reduction and Internal Fixation of a Closed Bimalleolar Ankle Fracture

"[A] 45-year-old woman; BMI 35; otherwise healthy; bimalleolar closed ankle fracture from slip and fall. She has no previous history of ankle/foot problems. The patient is a stay-at-home mother. She has been taking 2-3 tablets per day of 5 mg hydrocodone since her injury."

Scenario 4 Procedure: Tibiotalocalcaneal Arthrodesis with Tendo Achilles Lengthening

"[A] 65-year-old man, insulin-dependent diabetic, BMI 40, has Charcot arthropathy of the foot and ankle and significant deformity. He has altered but intact sensation. He has a history of low back pain and takes daily acetaminophen and occasional hydrocodone."

Scenario 5 Procedure: Total Ankle Arthroplasty with Tendo Achilles Lengthening

"[A] 59-year-old woman with post-traumatic ankle arthritis. She has a history of fibromyalgia and chronic pain. She has been on hydrocodone 5 mg, two to three tablets per day for more than 2 years as well as an anti-depressant medication. She is under the care of a chronic pain physician, who refuses to make recommendations on a postoperative pain medication plan. She is otherwise healthy."

Appendix 2. Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Checklist Item	Explanation	Page No.
Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.)	2
IRB approval	Mention whether the study has been approved by an IRB.	2
Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	2
Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	2
Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	3
Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a "closed survey" is open only to a sample that the investigator knows (password-protected survey).	2
Contact mode	Indicate whether the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	2
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists [If yes, which ones?]) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	2
Web/e-mail	State the type of e-survey (eg, one posted on a Web site, or one sent through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	NA (Qualtrics)
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could preselect the sample or influence the results. For example, a survey about vaccination on an anti-immunization Web site will have different results from a Web survey conducted on a government Web site.	2
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	2
Incentives	Were any incentives offered (eg, monetary, prizes, or nonmonetary incentives, such as an offer to provide the survey results)?	3
Time/date	In what time frame were the data collected?	2
Randomization of items or questionnaires	To prevent biases, items can be randomized or alternated.	NA
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce the number and complexity of the questions.	NA
Number of items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	3
Number of screens (pages)	Across how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	NA
Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if "yes," how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a nonresponse option such as "not applicable" or "rather not say," and selection of one response option should be enforced.	NA (Qualtrics)
Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step that displays a summary of the responses and asks the respondents if they are correct).	3

continued

Checklist Item	Explanation	Page No.
Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	NA (Qualtrics)
View rate (ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1% if the survey is voluntary.	NA (Qualtrics)
Participation rate (ratio of unique visitors who agreed to participate/ unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, eg, by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consent page, if present). This can also be called "recruitment" rate.	NA (Qualtrics)
Completion rate (ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page divided by the number of people who agreed to participate (or submitted the first survey page). This is relevant only if there is a separate "informed consent" page or if the survey goes over several pages. This is a measure for attrition. Note that "completion" can involve leaving questionnaire items blank. This is not a measure for how completely questionnaires were filled in. (If you need a measure for this, use the word "completeness rate.")	Fig. 1
Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	NA
Registration	In "closed" (non-open) surveys, users need to log in first, and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	NA (Open survey)
Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires that terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	3
Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the time frame that was used as a cutoff point, and describe how this point was determined.	NA
Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the nonrepresentative sample; if so, please describe the methods.	3

Abbreviations: IRB, institutional review board; NA, not applicable.

This checklist has been modified from Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). J Med Internet Res **6:** e34, 2004 [erratum in J Med Internet Res **14:** e8, 2012]. Available at: https://www.jmir.org/2004/3/e34/; erratum available at https://www.jmir.org/2012/1/e8/.