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SPECIAL ARTICLE

Elective surgery in ankle and foot disorders—best practices for management of pain: a guideline for clinicians

Chirurgie élective de la cheville et du pied – meilleures pratiques pour la prise en charge de la douleur : une ligne directrice pour les cliniciens

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Abstract

Purpose *Complex elective foot and ankle surgeries are often associated with severe pain pre- and postoperatively. When inadequately managed, chronic postsurgical pain and long-term opioid use can result. As no standards currently exist, we aimed to develop best practice pain management guidelines.*

Methods *A local steering committee (n = 16) surveyed 116 North American foot and ankle surgeons to understand the "current state" of practice. A multidisciplinary expert panel (n = 35) was then formed consisting of orthopedic surgeons, anesthesiologists, chronic pain physicians, primary care physicians, pharmacists, registered nurses, physiotherapists, and clinical psychologists. Each expert provided up to three pain management recommendations for each of the presurgery, intraoperative, inpatient postoperative, and postdischarge periods. These preliminary recommendations were reduced, refined, and sent to the expert panel and "current state" survey respondents to create a consensus document using a Delphi process conducted from September to December 2020.*

Results *One thousand four hundred and five preliminary statements were summarized into 51 statements. Strong consensus (≥ 80% respondent agreement) was achieved in 53% of statements including the following: postsurgical*

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opioid use risk should be assessed preoperatively; opioid-naïve patients should not start opioids preoperatively unless non-opioid multimodal analgesia fails; and if opioids are prescribed at discharge, patients should receive education regarding importance of tapering opioid use. There was no consensus regarding opioid weaning preoperatively.

Conclusions *Using multidisciplinary experts and a Delphi process, strong consensus was achieved in many areas, showing considerable agreement despite limited evidence for standardized pain management in patients undergoing complex elective foot and ankle surgery. No consensus on important issues related to opioid prescribing and cessation highlights the need for research to determine best practice.*

Keywords foot and ankle · guidelines · opioid use · pain · surgery

Deformity and arthritis of the ankle and hindfoot can lead to severe pain before and after surgical correction. When inadequately managed, chronic postoperative pain can result. Chronic postoperative pain is defined by the International Association for the Study of Pain as pain that develops after a surgical procedure and that lasts more than two months postsurgery, when other causes of pain have been excluded.[1] The incidence of chronic postoperative pain one year after scheduled foot or ankle surgery in patients receiving multimodal pain management has been reported at 21% for moderate-to-severe pain at rest and 43% for moderate-to-severe pain during walking.[2]

Opioid medications are part of a multimodal approach for pain management following elective foot and ankle surgery. The goal of opioid therapy is to prescribe the briefest, least invasive, and lowest dose regimen that minimizes pain and avoids common side effects[3,4] such as sedation, nausea, vomiting, constipation, and respiratory depression.[5,6] Preoperative opioid misuse is associated with increased morbidity and mortality.[7] The USA and Canada have the highest opioid consumption in the world.[8] A recent prospective cohort study conducted across eight countries examined opioid use within three months of surgery and opioid prescription on discharge. This landmark investigation concluded that physicians in the USA prescribe "alarmingly high" quantities of opioids postoperatively compared with quantities prescribed by physicians in other countries.[9] Therefore, promoting opioid-sparing pain management approaches to reduce opioid-related adverse events in North America is critical.

We previously completed a scoping review to determine the evidence for analgesia strategies after elective foot and ankle surgery and found very limited evidence, especially outside of hospital settings.[10] Only seven randomized trials were included and only two followed patients beyond two days postoperatively.[11,12]

To address this significant evidence gap, we used multidisciplinary experts and an iterative Delphi Consensus methodology to develop consensus-based best practice guidelines for assessment and treatment of pain over the entire care continuum (i.e., preoperative and postdischarge community management as well as in-hospital care) for patients undergoing elective foot and ankle surgery.

Methods

The web-based survey and consensus work received ethics approval from the Health Research Ethics panel at the University of Alberta (Edmonton, AB, Canada) with consent implied with the completion of the online documents as per our approved ethics protocol (PRO00075090).

North American survey

To understand current North American standards of care as well as interest in developing consensus-based guidelines, we initially conducted a "current state" survey of subspecialty foot and ankle surgeons who were members of the American (AOFAS) or Canadian (COFAS) Orthopedic Foot and Ankle Society. The survey questions included defining persistent postoperative pain, asking about current tools to measure pain, postoperative opioid prescribing practices, multimodal pain management approaches including non-opioid and non-pharmacological options, and surgeon-related demographics. The AOFAS and COFAS distributed the survey to maintain anonymity. As their distribution lists included clinic emails, the associations were unable to provide the number of individuals receiving the request for participation. Of the 116 surgeons who responded to the survey, 49 (42%) indicated that their current perioperative pain management was not standardized (Electronic Supplementary Material [ESM] eTable 1). Survey respondents were also asked to participate in developing consensus-based opioid-sparing guidelines, with 36 respondents expressing interest. Of these 36, six foot and ankle surgeons with published research in foot and ankle surgical outcomes were invited to join the expert panel while the remaining 30 respondents were asked to participate in the consensus process (Fig. 1).

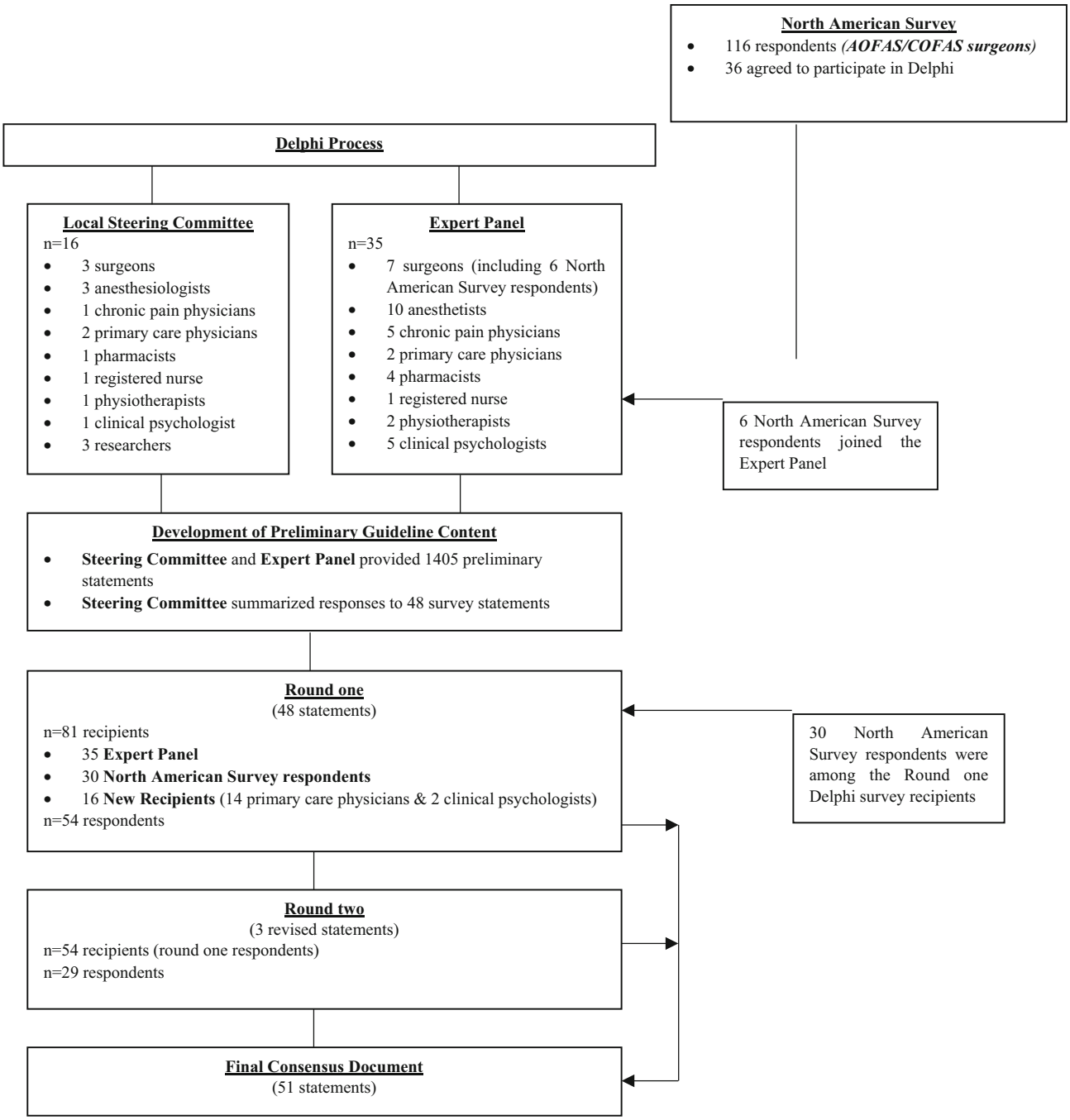

Fig. 1 Study flow diagram

Delphi process

Following the survey, we formed a multidisciplinary steering committee (n = 16) of clinical experts and researchers from the University of Alberta: three orthopedic surgeons, three anesthesiologists with a subspecialty interest in regional anesthesia and acute pain management, one chronic pain physician, two primary care physicians, one pharmacist, one acute pain service registered nurse, one physiotherapist, one clinical psychologist, and three researchers (Fig. 1). The researchers had clinical backgrounds in musculoskeletal rehabilitation and research training in epidemiology (n = 2) or qualitative methods (n = 1).

We followed a Delphi process as it provides group viewpoint in the absence of sufficient evidence[13] and allows group feedback without the need for face-to-face interaction.[14,15] Recruitment bias was reduced by recruiting

participants from different and diverse geographical locations.[16] With no published standardized definitions of consensus levels,[17–20] we defined levels of consensus *a priori* using the following classification: strong consensus (≥ 80% respondent agreement), moderate consensus (60–79% respondent agreement), weak consensus (51–59% respondent agreement), and no consensus (≤ 50% respondent agreement).

Creation of expert panel

The steering committee members invited external experts from North America to join an expert panel to provide input into guideline development. Thirty-five external experts agreed to join this panel (seven orthopedic surgeons, ten acute pain anesthetists, four chronic pain physicians, two primary care physicians, four pharmacists, one registered nurse, two physiotherapists, and five clinical psychologists with expertise in pain) (Fig. 1).

Development of preliminary guideline content

Each expert panel member provided up to three "most important recommendations" for pain management in each time period: 1) presurgery (time from first preoperative visit with orthopedic surgeon up to, but not including, the day of surgery); 2) intraoperative; 3) inpatient postoperative (day 0 to discharge); 4) discharge to 2 weeks postdischarge; 5) 2–6 weeks postdischarge; 6) 6 weeks to 6 months postdischarge; 7) > 6 months postdischarge.

The expert panel members provided assessment and treatment recommendations in their areas of expertise (e.g., anesthesiologists provided input regarding nerve blocks). Treatment was categorized into pharmacologic and non-pharmacologic care with the pharmacologic section subdivided into sections for opioid-naïve and opioid-tolerant patients.

The target audience was healthcare providers (i.e., primary care/family physicians, allied health professionals, surgeons). The patient population was defined as community-dwelling adults (18–70 yr old) with isolated foot and ankle pain undergoing complex bony foot and ankle surgery (i.e., ankle replacement; ankle or hindfoot fusions; deformity corrections) who could be opioid-naïve or opioid-tolerant (i.e., any preoperative opioid use).

We received 1,405 preliminary statements from the expert panel. Two researchers, including one with qualitative research experience, summarized all statements as "assessment" or "treatment" recommendations under each of the initial seven time periods. The steering committee then met to review this initial classification of statements. To reduce the statements, many of which were similar, we allocated statement reviews to subgroups within our steering committee. The anesthesiologists and nurses looked at the in-hospital pain management while the physiotherapists and psychologists looked at non-pharmacologic pain management across the continuum. Family physicians and chronic pain physicians looked at statements around pre- and posthospital pain management and surgeons looked at statements across the entire continuum. This approach reduced the number of statements from 1,405 to 369.

The steering committee met again to review the 369 statements to reduce repetition from the subgroups' evaluations and to ensure that no important preliminary recommendations were omitted. We also consolidated the postdischarge period as there was significant repetition of statements, leaving four time periods overall (presurgery [time from first preoperative surgeon visit up to, but not including, surgery]; intraoperative; inpatient care [day 0 to discharge]; and postdischarge [up to six months postoperative]). This step reduced the content to approximately 50 statements.

The steering committee met a final time to review these statements and to reduce duplication and ensure that no important recommendations were missing. The steering committee then formulated the final 48 statements for the initial consensus round to be as clear and concise as possible.

The statements had a four-point Likert scale, multiple choice, or ranking response option. We included the options "outside area of expertise" and "other" for all questions.

In our initial consensus round, as a final check on our process of reducing from 1,405 to 48 statements, we asked respondents to add further recommendations if they felt that the consensus statements did not capture all important issues. No new recommendations were suggested by respondents, who included those who created the initial 1,405 statements.

Consensus round 1

Before sending out the online consensus document, the steering committee sought out additional new recipients to increase representation from primary care and psychology (14 primary care physicians and two clinical psychologists). The online consensus document was sent to 81 experts (30 North American current state survey respondents interested in guideline development, 35 expert panel members, 16 new recipients) using an online platform (SurveyMonkey; Momentive, San Mateo, CA, USA) with two weekly reminders. Respondents were

anonymous but provided their profession. Fifty-four of 81 (67%) recipients responded in round 1 (Fig. 1).

Consensus round 2

After reviewing round 1, the steering committee revised three statements to improve their clarity. A revised document of these three statements was sent to the round 1 respondents; 29/54 (54%) eligible recipients responded (Fig. 1).

Data management and analysis

A total of 51 statements (15 presurgery, eight intraoperative, 20 inpatient care, and eight postdischarge) were included across the two consensus rounds (Tables 1, 2, 3, 4 and ESM, eTable 2). The Likert options were collapsed into "disagree", "agree", and "other". Those who responded "outside area of expertise" were not included in the calculation of consensus for that statement. For ranked responses, we focused on the first rank option. Where consensus was lacking, we also reported if responses varied by discipline. We used our predefined consensus levels to create our guideline.

Results

Presurgery (time from first preoperative surgeon visit up to, but not including, surgery)

Assessment

We achieved strong consensus in 5/9 (55%) presurgery statements: assessing baseline pain, function and psychological status, as well as assessment of risk for persistent postsurgical pain and persistent postsurgical opioid use (Table 1: statements 1, 3, 5, 6, 8).

There was weak or no consensus regarding standardized assessment tools (see Table 1: statements 2, 4, 7, 9). Post hoc analysis showed that simpler pain assessment approaches were recommended mostly by surgeons, primary care/family physicians, physiotherapists, and nurses (i.e., non-pain specialists) with 17/22 (77%) recommending the Numeric Pain Scale. In contrast, the Brief Pain Inventory was recommended by 9/18 (50%) pain specialists (i.e., anesthesiologists, chronic pain physicians, and psychologists). Similarly, pain specialists preferred more comprehensive evaluation of psychological distress. Although using both the Hospital Anxiety and Depression Scale and the Pain Catastrophizing Scale was the most popular recommendation followed by each of these scales individually, 9/32 (28%) stated that a standardized tool is not required. Again, post hoc analysis revealed that 11/15 (73%) pain specialists recommended the use of either or both of these scales to assess psychological distress *vs* 4/12 (33%) non-pain specialists. Further, 7/12 (58%) non-pain specialists *vs* 2/15 (13%) pain specialists stated that a standardized psychological distress assessment tool is not required.

Consensus was also not reached on a functional assessment tool; 29/54 (54%) respondents stated that the question was outside their area of expertise while 15/24 (63%) recommended a specific functional tool. Eight out of 24 (33%) respondents indicated that a standardized tool is not required.

Treatment

We achieved strong consensus in 3/6 (50%) presurgery treatment statements (Table 1: statements 10, 13, 15). While there was strong consensus on avoiding opioids preoperatively in opioid-naïve patients (Table 1: statement 10), the consensus for managing opioid use preoperatively was weak in opioid-tolerant patients (Table 1: statement 11). While there was moderate consensus regarding who should be responsible for prescribing preoperative opioids (Table 1: statement 12), strong consensus was achieved that the orthopedic surgeon should take the primary role in providing education regarding early postoperative expectations of pain and function using both written and verbal instructions (Table 1: statements 13, 15).

Intraoperative

Treatment

We achieved strong consensus in 4/8 (50%) intraoperative statements (Table 2: statements 16, 17, 20, 23). Regional anesthesia was strongly recommended as a standard of intraoperative care (Table 2: statement 16), but there was no consensus regarding the most appropriate approach (Table 2: statement 19). Unlike perineural or systemic dexamethasone and acetaminophen (Table 2: statements 20, 23), there was no consensus on administering gabapentin and weak consensus on administering ketamine intraoperatively (Table 2: statements 18, 21). For opioid-tolerant patients, there was strong consensus on managing the opioid component of intraoperative analgesia (Table 2: statement 17) and moderate consensus that the non-opioid component of a multimodal analgesia regime should be the same for opioid-naïve and opioid-tolerant patients (Table 2: statement 22).

Table 1 Responses to the statements for presurgery period

Presurgery (time from first preoperative visit with surgeon up to, but not including, the day of surgery)

	Statement	Category	Total responses	Response*	Consensus
1	Baseline pain should be assessed using standardized and validated measures	Assessment	54	Agree: 49/54 (91%)	Strong
2	What standardized measure would you recommend to assess baseline pain?	Assessment	49	Numeric Pain Scale: 26/49 (53%) Brief Pain Inventory: 14/49 (29%) Other: 6/49 (12%) Standardized tool is NOT required: 2/49 (4%) McGill Pain Questionnaire: 1/49 (2%)	Weak
3	Function should be assessed using standardized and validated measures	Assessment	53	Agree: 47/53 (89%)	Strong
4	What standardized measure would you recommend to assess function?	Assessment	24	Standardized tool is NOT required: 8/24 (33%) Other: 6/24 (25%) Lower Extremity Functional Scale: 4/24 (17%) Foot and Ankle Ability Measure: 3/24 (13%) Foot and Ankle Disability Index: 3/24 (13%)	None
5	The risk for persistent postsurgical pain should be assessed preoperatively using patient- and surgery-specific risk factors (e.g., duration of surgery, surgical complications) known to predispose patients to the development of persistent postsurgical pain	Assessment	51	Agree: 46/51 (90%)	Strong
6	The risk for persistent postsurgical opioid use should be assessed preoperatively, independently of assessment for persistent postsurgical pain	Assessment	50	Agree: 48/50 (96%)	Strong
7	What standardized measure would you recommend to assess the risk for persistent postsurgical opioid use?	Assessment	33	Opioid Risk Tool: 16/33 (48%) Standardized tool is NOT required: 8/33 (24%) Other: 5/33 (15%) Screener and Opioid Assessment for Patients in Pain: 4/33 (12%) Diagnosis, Intractability, Risk, Efficacy: 0 (0%) Revised Screener and Opioid Assessment for Patients in Pain: 0 (0%)	None
8	Psychological status (e.g., mood) and distress (anxiety, depression, catastrophizing) should be assessed preoperatively.	Assessment	51	Agree: 46/51 (90%)	Strong
9	What standardized tool would you recommend to assess psychological distress?	Assessment	32	Both Hospital Anxiety and Depression Scale and Pain Catastrophizing Scale: 11/32 (34%) Standardized tool is NOT required: 9/32 (28%) Pain Catastrophizing Scale: 5/32 (16%) Other: 5/32 (16%) Hospital Anxiety and Depression Scale: 2/32 (6%)	None
10	Opioids should not be started in the opioid-naïve patient preoperatively unless non-opioid multimodal analgesia fails.	Treatment	50	Agree: 43/50 (86%)	Strong

Table 1 continued

Presurgery (time from first preoperative visit with surgeon up to, but not including, the day of surgery)

Statement	Category	Total responses	Response*	Consensus
11 Opioid-tolerant patients should:	Treatment	46	Be weaned from their preoperative opioids as much as possible before surgery: 27/50 (59%)	Weak
			Not be weaned from their preoperative opioids before surgery: 15/50 (33%)	
			Other: 3/50 (7%)	
			Be weaned from their preoperative opioids entirely before surgery: 1/50 (2%)	
12 Regarding preoperative opioid prescribing:	Treatment	47	The orthopedic surgeon should work in tandem with the primary care/family physician: 31/47 (66%)	Moderate
			The primary care/family physician continues to be responsible for all opioid prescribing: 10/47 (21%)	
			Other: 4/47 (9%)	
			The orthopedic surgeon assumes full responsibility: 2/47 (4%)	
13 Education regarding postoperative expectations of pain and function should be provided by:	Treatment	53	Orthopedic surgeon: 48/53 (91%)	Strong
			Nurse: 2/53 (4%)	
			Primary care/family physician: 2/53 (4%)	
			Physiotherapist: 1/53 (2%)	
14 Should other providers be considered to provide education regarding postoperative expectations of pain and function?	Treatment	54	No: 29/54 (54%)	Weak
			Yes: 25/54 (46%)	
15 Education regarding postoperative expectations of pain and function should be provided using:	Treatment	54	Written AND verbal instructions: 47/54 (87%)	Strong
			Verbal instructions: 5/54 (9%)	
			Written instructions: 1/54 (2%)	
			Other: 1/54 (2%)	

*The "Other" responses are provided in the Electronic Supplementary Material eTable 2

Inpatient care (day 0 to discharge)

Assessment

We achieved strong consensus for 4/6 (67%) inpatient assessment statements (Table 3: statements 29, 30, 32, 36). Assessing the ability to participate in rehabilitation was strongly recommended (Table 3: statement 36), as was using the Pain Catastrophizing Scale (Table 3: statements 29, 30). Moderate consensus was obtained for assessing psychological factors affecting pain management before discharge (Table 3: statement 28) and using the Hospital Anxiety and Depression Scale to determine appropriate psychiatry/psychology referrals (Table 3: statements 31, 32). Post hoc analysis revealed that more non-pain specialists (6/21; 29%) than pain specialists (4/18; 22%) indicated that this assessment was not recommended.

Treatment

We achieved strong consensus in 6/14 (43%) inpatient treatment statements (Table 3: statements 34, 35, 37, 38, 39, 40). There was only moderate consensus about using regional anesthesia as a standard of care for postoperative analgesia (Table 3: statement 27). Further, there was weak to moderate consensus on using nonsteroidal anti-inflammatory drugs or acetaminophen around the clock for 48 hr (Table 3: statements 24, 25) and no consensus regarding gabapentin use postoperatively (Table 3: statement 26). There was strong consensus on using

Table 2 Responses to the statements for intraoperative period

Intraoperative				
Statement	Category	Total responses	Response*	Consensus
16 Regional anesthesia should be considered a standard of care for intraoperative analgesia	Treatment	38	Agree: 31/38 (82%)	Strong
17 For opioid-tolerant patients who have general anesthesia, breakthrough opioid medication to supplement nerve blocks may need to be of a higher dose	Treatment	39	Agree: 36/39 (92%)	Strong
18 Ketamine should be considered a routine component of multimodal analgesia for:	Treatment	22	Opioid-tolerant patients only: 12/22 (55%) All patients: 8/22 (37%) Other: 2/22 (9%) Opioid-naïve patients only: 0 (0%)	Weak
19 Considering regional anesthesia for major hindfoot surgery, the most appropriate approach is:	Treatment	31	Preoperative placement of a continuous popliteal sciatic nerve block and a single shot saphenous nerve block: 13/31 (42%) Preoperative placement of single shot popliteal sciatic nerve block and a single shot saphenous nerve: 8/31 (26%) Preoperative placement of a continuous popliteal sciatic nerve block and a continuous saphenous nerve block: 6/31 (19%) Ankle block or incisional infiltration with local anesthetic: 2/31 (6%) Other: 2/31 (6%)	None
20 For multimodal analgesia, administration of acetaminophen should be routine if there are no contraindications	Treatment	44	Agree: 43/44 (98%)	Strong
21 For multimodal analgesia, administration of gabapentin should be routine if there are no contraindications.	Treatment	40	Agree: 20/40 (50%)	None
22 The non-opioid component of intraoperative analgesia should be the same for both opioid-naïve and opioid-tolerant patients	Treatment	38	Agree: 29/38 (76%)	Moderate
23 Perineural or systemic dexamethasone should be considered as an adjunct for nerve block prolongation	Treatment	27	Agree: 22/27 (81%)	Strong

*The "Other" responses are provided in the Electronic Supplementary Material eTable 2

breakthrough opioids in opioid-tolerant patients (Table 3: statements 34, 35), but only moderate consensus on avoiding postoperative opioids in opioid-naïve patients (Table 3: statement 33).

If opioids are prescribed at discharge, it was strongly recommended that patients should be educated regarding adverse effects/potential long-term complications as well as tapering opioid use (Table 3: statements 37; 38). Further, it was strongly recommended that a postsurgical summary/plan with a clear opioid weaning strategy should be communicated to the family physician before discharge (Table 3: statements 39, 40). There was moderate consensus that the orthopedic surgeon should take the primary role in managing pain during the initial two postdischarge weeks (statement 42; Table 3).

Postdischarge (up to six months postoperative)

Treatment

We achieved strong consensus in 5/8 (62%) postdischarge statements (Table 4: statements 46, 47, 49, 50, 51). Fifty-five percent of respondents agreed that opioid prescription should be stopped by two weeks postoperatively for opioid-naïve patients (weak consensus, Table 4: statement 45), but no consensus was achieved regarding timing of stopping

Table 3 Responses to the statements for inpatient period

Inpatient care (day 0 to discharge)				
Statement	Category	Total Responses	Response*	Consensus
24 Acetaminophen should be used:	Treatment	44	Around the clock for 48 hours after surgery: 31/44 (70%) Other: 8/44 (18%) On a "as needed" basis: 3/44 (7%) Around the clock for 24 hours after surgery: 2/44 (5%)	Moderate
25 In eligible patients, NSAIDs should be used:	Treatment	45	Around the clock for 48 hours: 24/45 (53%) On a PRN basis for up to 48 hours: 10/45 (22%) Other: 6/45 (13%) Around the clock for 24 hours: 3/45 (7%) Not after surgery: 2/45 (4%)	Weak
26 Gabapentin should be used:	Treatment	37	PRN as an adjunct: 12/37 (32%) Around the clock for 48 hours: 8/37 (22%) Other: 8/37 (22%) Should not be prescribed: 7/37 (19%) Around the clock for 24 hours: 2/37 (5%)	None
27 Regional anesthesia should be considered a standard of care for postoperative analgesia	Treatment	38	Agree: 30/38 (79%)	Moderate
28 Psychological factors affecting pain management should be formally assessed at least once prior to discharge	Assessment	48	Agree: 37/48 (77%)	Moderate
29 As part of a comprehensive assessment, the Pain Catastrophizing Scale is an important tool to support decision-making on determining appropriate psychiatry/psychology referrals	Assessment	20	Agree: 17/20 (85%)	Strong
30 Pain Catastrophizing Scale score >30 in psychological assessment should prompt referral to psychiatry/psychology services as appropriate	Assessment	16	Agree: 15/16 (94%)	Strong
31 As part of a comprehensive assessment, the HADS is an important tool to support decision-making on determining appropriate psychiatry/psychology referrals	Assessment	17	Agree: 13/17 (76%)	Moderate
32 HADS score >15 in psychological assessment should prompt referral to psychiatry/ psychology services as appropriate	Assessment	14	Agree: 12/14 (86%)	Strong
33 While in hospital, avoid opioids in opioid-naïve patients unless pain is $\geq$ 4 on a visual analog scale following administration of non-opioid multimodal analgesia	Treatment	44	Agree: 33/44 (75%)	Moderate
34 Opioid-tolerant patients may require higher doses of breakthrough opioids postoperatively in addition to their baseline opioid usage during in-hospital stay	Treatment	46	Agree: 43/46 (93%)	Strong
35 Opioid-tolerant patients may require more frequent doses of breakthrough opioids postoperatively in addition to their baseline opioid usage during in-hospital stay	Treatment	44	Agree: 36/44 (82%)	Strong
36 While in hospital, daily standardized pain assessment should include the ability to participate in physiotherapy and rehabilitation		50	Agree: 49/50 (98%)	Strong

Table 3 continued

Inpatient care (day 0 to discharge)				
Statement	Category	Total Responses	Response*	Consensus
37 If opioids are prescribed at discharge, patients should be educated regarding tapering of opioids as surgical pain decreases	Treatment	51	Agree: 49/51 (96%)	Strong
38 If opioids are prescribed at discharge, patients should be educated regarding the adverse effects and potential long-term complications of opioids	Treatment	51	Agree: 48/51 (94%)	Strong
39 A clear opioid weaning strategy should be in place and communicated to the primary care/family physician prior to discharge	Treatment	51	Agree: 42/51 (82%)	Strong
40 At hospital discharge, the primary care/family physician should receive communication regarding postsurgical summary and plan	Treatment	28	Agree: 27/28 (96%)	Strong
41 Communication with the primary care/family physician regarding postsurgical summary and plan should be:	Treatment	27	Written: 18/27 (67%) Both: 8/27 (30%) Other: 1/27 (4%) Verbal: 0 (0%)	Moderate
42 For the first two weeks, postoperative pain should be managed by the:	Treatment	51	Orthopedic surgeon: 31/51 (61%) Hospital-based physician (pain physician, hospitalist, physician assistant): 15/51 (29%) Primary care/family physician: 5/51 (10%)	Moderate
43 Should other providers be considered to manage postoperative pain for the first two weeks?	Treatment	52	No: 28/52 (54%) Yes: 24/52 (46%)	Weak

*The "Other" responses are provided in the Electronic Supplementary Material eTable 2

HADS = Hospital Anxiety and Depression Scale; NSAIDS = nonsteroidal anti-inflammatory drugs

postdischarge opioid prescription for opioid-tolerant patients (Table 4: statement 44). If pain beyond two weeks was suspicious for postsurgical neuropathy or complex regional pain syndrome, there was strong consensus that antineuropathic medication should be started (Table 4: statement 46). While it was strongly recommended that activity should be encouraged, despite pain, if the structural result of surgery is good (Table 4: statement 47), no consensus was achieved regarding the timing of referral to a multidisciplinary pain service (Table 4: statement 48). Early mobilization and psychological strategies were strongly recommended (Table 4: statements 49, 50, 51).

Discussion

Because evidence for standardized pain management is lacking for patients undergoing complex elective foot and ankle surgery, we undertook a Delphi process with a multidisciplinary group of clinicians with experience in foot and ankle surgery and/or pain management. Figure 2 summarizes our recommendations. The strong consensus achieved in many statements points to agreement among clinicians in what they currently recommend, despite the lack of evidence. Nevertheless, lack of consensus on important issues related to opioid prescribing and cessation highlights the urgent need for research to determine best practice for opioid-sparing pain management.

Strong consensus was reached on avoiding opioids preoperatively in opioid-naïve patients, providing useful guidance for managing the majority of this cohort. It is perhaps unsurprising that strong consensus was not achieved for the more controversial issue of managing opioid-tolerant patients. The most popular approach, favored by 59% of respondents, was to wean as much as possible preoperatively while almost a third of our expert panel expressed support for not weaning opioids preoperatively. Preoperative opioid use is a risk factor for both persistent postoperative surgical pain and persistent postoperative opioid use.[21,22] The risk of opioid use in this particular surgical population at three months after surgery

Table 4 Responses to the statements for postdischarge period

Postdischarge (six months postoperative)				
Statement	Category	Total responses	Response*	Consensus
44 Opioid-tolerant patients should be back to their baseline opioid use by:	Treatment	42	2 weeks postoperative: 19/42 (45%) 6 weeks postoperative: 12/42 (29%) Other: 6/42 (14.29%) 1 week postoperative: 4/42 (10%) Discharge: 1/42 (2%)	None
45 For opioid-naïve patients, opioid prescription for surgical pain should be stopped by:	Treatment	42	2 weeks postoperative: 23/42 (55%) 1 week postoperative: 10/42 (24%) Other: 5/42 (12%) 6 weeks postoperative: 3/42 (7%) Discharge: 1/42 (2%)	Weak
46 Patients with continued complaints of pain beyond 2 weeks should be started on an antineuropathic medication, if postsurgical neuropathy or complex regional pain syndrome is suspected	Treatment	37	Agree: 33/37 (89%)	Strong
47 If the structural result of surgery is good, activity should be encouraged, despite pain	Treatment	46	Agree: 40/46 (87%)	Strong
48 Referral to a multidisciplinary pain service should be considered if the structural goals of surgery have been met and the patient is still experiencing pain at:	Treatment	48	3 months postoperative: 19/48 (40%) 6 weeks postoperative: 14/48 (29%) 6 months postoperative: 11/48 (23%) Other: 4/48 (8%)	None
49 Rehabilitation including early mobilization is recommended per postsurgical protocol and missed milestones should be communicated to the surgeon	Treatment	48	Agree: 46/48 (96%)	Strong
50 Psychological management of problematic mood symptoms and elevated distress is recommended	Treatment	44	Agree: 42/44 (95%)	Strong
51 What psychological strategies would you recommend for the management of elevated distress?	Treatment	32	Cognitive behavioral therapy: 3/32 (9%) Acceptance-based strategies: 0 (0%) Mindfulness-based strategies: 0 (0%) All of above: 29/32 (91%) Other: 0 (0%)	Strong

*The "Other" responses are provided in the Electronic Supplementary Material eTable 2

appears lower in patients who were occasional (less than daily) opioid users preoperatively rather than regular or daily users.[23] Further study is required to investigate whether preoperative weaning reduces postoperative risk.

There is a paucity of data on the risk of PPOU. The American Society for Enhanced Recovery and Perioperative Quality Initiative-4 Joint Consensus Statement on PPOU identified 46 articles in a recent systematic review addressing continued opioid use after hip and knee arthroplasty, abdominopelvic surgery, spine surgery, thoracic surgery, and mastectomy.[24] The incidence of PPOU in opioid-naïve patients ranged from 2% to 6% but was over 30% in opioid-tolerant patients. Several tools exist to assess risk for developing opioid use disorder.[25–27] The lack of a strong consensus may reflect either insufficient awareness, lack of specificity of existing risk scores, or challenges inherent in incorporating such tools into busy clinics with limited resources. While more research to identify patient- and surgery-specific characteristics for PPOU is needed, recent development and validation of a bedside risk assessment tool suggests progress.[28]

Interestingly, while we had strong consensus to evaluate preoperative pain, psychological distress, and function, there was a lack of consensus for specific standardized assessment tools. This finding points to agreement among clinicians regarding a need for assessment but a lack of clarity around operationalization. Pain is influenced by physiologic, psychological, and environmental factors such as previous experience with pain, culture, coping

Pre-Surgery

- Baseline pain, function and psychological status should be assessed at the first preoperative encounter with the surgeon using standardized and validated measures.
- The risk for persistent postsurgical pain should be assessed using patient- and surgery-specific risk factors.
- The risk for persistent postsurgical opioid use should be assessed independently of assessment for persistent postsurgical pain.
- Opioid analgesia should not be started preoperatively in opioid-naïve patients unless non-opioid multimodal analgesia fails.
- Education regarding postoperative expectations around pain and function should be provided through preoperative discussion with the orthopedic surgeon.
- Access to educational printed material should be provided to supplement these discussions.

Intra-operative

- Regional anesthesia is a standard of care for intraoperative analgesia.
- Perineural or systemic dexamethasone should be considered as an adjunct for prolongation of the duration of nerve blockade.
- Acetaminophen should be a routine component of multimodal analgesia in the absence of contraindications.
- Opioid-tolerant patients may require higher doses of opioid analgesia, as compared to opioid naïve patients, to supplement analgesia provided by nerve blockade.

Inpatient

- Consideration should be given to continuous regional anesthesia as a central component of multimodal postoperative analgesia.
- The perioperative team should be aware that opioid-tolerant patients may require higher and more frequent doses of breakthrough opioid analgesia in addition to their baseline opioid use.
- Prior to discharge, consideration should be given to formal assessment of psychological factors affecting pain management.
- We recommend use of the Pain Catastrophizing Scale to support decision making with regard to referrals to psychology and psychiatry services.
- A Pain Catastrophizing score >30 should prompt such a referral when deemed appropriate by the primary care team.
- Consideration should be given to use of the Hospital Anxiety and Depression Scale when determining the appropriateness of referrals to psychology or psychiatry services.
- If Hospital Anxiety and Depression Scale is used, we recommend a score of > 15 as an appropriate prompt for referral.
- We recommend daily standardized pain assessments which include the ability to participate in physiotherapy and rehabilitation.
- If opioids are prescribed at discharge patients should be educated regarding the adverse effects and potential long-term complications of opioid use.
- A clear opioid weaning strategy should be in place which is communicated to both the patient and the primary care physician.
- Consideration should be given to appointing the orthopedic surgeon as the primary opioid prescriber for the first two postoperative weeks.

Post-discharge

- Patients with a complaint of pain beyond 2 weeks after surgery should be started on an antineuropathic medication, if post-surgical neuropathy or Complex Regional Pain Syndrome is suspected.
- Activity should be encouraged, even in the presence of pain, if the structural result of surgery is good.
- Rehabilitation including early mobilization is recommended per post-surgical protocol and missed milestones should be communicated to the surgeon.
- We recommend psychological management of problematic mood symptoms and elevated distress.
- Cognitive-behavioural therapy, acceptance-based strategies and mindfulness-based strategies should all be considered.

◀**Fig. 2** Recommendations with strong consensus for pain management in patients undergoing elective foot and ankle surgery

mechanisms, and anxiety.[29] Unidimensional pain scales measure pain intensity while multidimensional measures of pain intensity assess impact of current pain on a specific activity;[30,31] consensus among pain specialists highlights the need to assess the impact of pain on the functional capacity and emotional and social wellbeing of patients.[29]

Similarly, consensus was lacking on the most appropriate standardized tool to assess psychological distress preoperatively with only moderate consensus on the need to assess the impact of psychological factors on pain management before hospital discharge. Overall, pain specialists recommended more comprehensive assessment tools while non-pain specialists typically selected simpler tools or indicated that a standardized tool not be recommended. Although this was a post hoc finding and requires further investigation, it may reflect an important knowledge gap related to insufficient evidence to recommend validated tools in specific clinical settings or to apply available tools. As surgeons and primary care/family physicians are the core professionals managing these patients, education regarding appropriate standardized assessment is crucial. Nevertheless, resources for healthcare professionals to manage or refer patients appropriately must also be available; this area requires further investigation.

The weak consensus for intraoperative ketamine is not unexpected. A large systematic review (n = 130 studies; 8,341 participants) of perioperative intravenous ketamine to manage acute pain found extremely heterogenous practices.[32] The authors concluded that ketamine likely reduces postoperative analgesic consumption and pain intensity with few adverse central nervous system effects, similar to that reported in opioid-tolerant patients undergoing major back surgery.[33,34]

Only 50% of our expert panel agreed that gabapentin should be part of a multimodal analgesia regime in the absence of contraindications. Gabapentin, originally marketed as an anticonvulsant, was subsequently approved to treat chronic neuropathic pain. Off-label use for managing acute postoperative pain has increased, ostensibly with widespread acceptance of enhanced recovery after surgery protocols.[35] Two recent systematic reviews with meta-analyses have highlighted a lack of evidence for this indication.[36,37] In a meta-analysis of 281 randomized trials, Verret *et al.* found no clinically meaningful difference in acute pain while adverse effects were greater with gabapentinoid use.[37]

We also did not reach consensus on expected duration of postoperative opioid use for opioid-tolerant patients. We reached weak consensus (55%) that opioid-naïve patients should discontinue opioid use by two weeks postoperatively. We failed to achieve consensus on the appropriate time for return to baseline opioid use in opioid-tolerant patients. Though we advocate for individualized medicine, there appears to be a trend toward a short postoperative period of opioid use for acute surgical analgesia.

The appropriate time for referral to a multidisciplinary pain service was also unclear. More respondents (40%) favored referral at three months after surgery, but some respondents chose six weeks, which underscores the potential usefulness of early referral to a multidisciplinary pain or transitional pain clinic to avoid PPOU.[21,38]

Our recommendations are the first consensus guidelines for perioperative pain management related to complex foot and ankle surgery. Other existing resources address procedure specific pain management[39,40] including procedure specific postoperative pain management (PROSPECT), which uses an evidence-based research methodology to develop consensus recommendations for managing postoperative pain.[40] Our guidelines agree with the opioid-sparing focus of recent PROSPECT recommendations for total hip arthroplasty and hallux valgus repair pain management.[41,42] While the very nature of our work advocates against a uniform approach to postoperative analgesia, it is interesting that both PROSPECT guidelines recommended opioid use only for rescue analgesia postoperatively.[41,42] While opioid-sparing strategies should be strongly encouraged as standards of care, opioid analgesia will likely still be required perioperatively. Our guidelines may be more pragmatic in their advocacy to recognize and identify the risk for PPOU and subsequent management from the first preoperative visit. Overton *et al.* used a Delphi process with a single-institution, multidisciplinary expert panel to establish consensus on ideal opioid prescribing after 20 common surgical procedures.[39] One primary recommendation was advising patients to maximize non-opioid analgesia, but the panel recognized that, for some procedures, postoperative pain would rarely be managed without opioids. In comparison with these recent consensus guidelines,[39,41,42] our recommendations acknowledge the risk for PPOU and provide an extensive framework for screening and management as needed.

Knowledge translation to relevant stakeholders is underway to ensure implementation of our consensus recommendations both locally and further afield. In addition to peer review publications and presentations, this includes dissemination to patients, healthcare

providers/managers, and policymakers. Postoperative expectations of pain and function to patients will be disseminated using websites, brochures, and preoperative educational sessions. Educational sessions for hospital and community physicians will communicate our strong recommendations as well as pointing out the urgent areas for further research.

Limitations

Although we used a rigorous guideline development process, we were hampered by the limited evidence base identified by our recent scoping review.[10] Thus, the guidelines were developed using multidisciplinary expert consensus. We had good engagement from our development group with greater than 50% response rates, reflecting strong clinical interest, but we were not able to discern the response rate of all COFAS and AOFAS members in our initial current state survey as the denominator for that survey could not be determined. Nevertheless, representativeness was not optimal (e.g., family practice was initially under-represented). Therefore, additional primary care physicians were recruited to strengthen the validity of the postdischarge component of these guidelines.

Conclusions

This multidisciplinary group offers current expert consensus recommendations on the assessment and treatment of pain for patients undergoing elective complex foot and ankle surgery through a robust Delphi process. System-wide processes are required to identify patients at risk for PPOU throughout the perioperative continuum. Strategies promoting opioid-sparing approaches should be advocated, including a regional anesthesia-centered multimodal analgesia protocol. An opioid weaning strategy should be implemented before discharge and clearly communicated to patients and primary care physicians. Future research is needed to determine the benefits of opioid tapering preoperatively and to evaluate the ideal time for opioid weaning postoperatively.

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