Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

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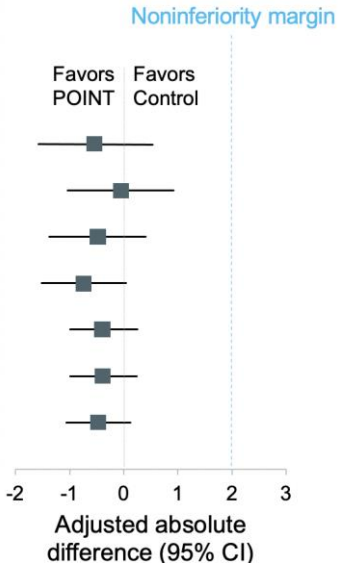
eFigure 1. Noninferiority analysis of patient-reported pain scores using the numeric rating scale

	Control (n=54)	POINT (n=48)	Mean difference (95% CI)	Adjusted difference (95% CI)	*P* value
Patients with ≥5 surveys completed, n (%)	52 (96.3)	47 (97.9)			
Daily peak pain scores, median (IQR)					
POD1	6 (4-8)	6 (4-7)	-0.01 (-1.00-0.98)	-0.52 (-1.57-0.53)	.34
POD2	5 (2-6)	5 (3-7)	0.25 (-0.71-1.20)	-0.06 (-1.04-0.92)	>.99
POD3	3 (2-5)	4 (2-5)	-0.14 (-0.99-0.71)	-0.48 (-1.37-0.41)	.40
POD4	3 (2-4)	3 (2-4)	-0.48 (-1.24-0.27)	-0.74 (-1.52-0.04)	.14
POD5	2 (1-4)	2 (1-3)	-0.22 (-0.84-0.40)	-0.38 (-1.02-0.26)	.39
POD6	2 (1-3)	2 (1-3)	-0.25 (-0.84-0.34)	-0.37 (-0.99-0.24)	.28
POD7	1 (1-3)	1.5 (1-3)	-0.26 (-0.82-0.31)	-0.46 (-1.06-0.13)	.28



Noninferiority analysis of patient-reported pain scores using the numeric rating scale. The primary outcome of outpatient postoperative pain scores in the first week after surgery was assessed based on daily patient surveys. Mean differences were calculated from control scores subtracted from POINT scores and adjusted for differences in independent covariates between groups (age and surgical procedure). Noninferiority was established if the upper boundary of the 1-sided 95% CI was less than the noninferiority margin of 2 points on the numeric rating scale for pain. Pain scores in the POINT group were not worse than pain scores in the control group in the first postoperative week.

Abbreviations: POINT, postoperative opt-in narcotic treatment; IQR, interquartile range; CI, confidence interval; POD, postoperative day.

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eTable 1. Noninferiority analysis for postoperative day 7 health-related quality of life assessment

	Control (n=54)	POINT (n=48)	*P* value	Mean difference† (95% CI)	Adjusted difference‡ (95% CI)	MCID*	Noninferiority established
HRQOL questionnaire completed, n (%)	47 (88.7)	43 (89.6)					
PROMIS-29 v2.0 T-scores, median (IQR)							
Physical function	43.9 (39.6-47.8)	44.7 (32.6-56.9)	.29	1.92 (-1.35-5.20)	1.61 (-1.86-5.01)	4.14	Yes
Anxiety	51.4 (40.3-57.7)	53.8 (44.2-58.6)	.26	2.09 (-2.13-6.31)	1.43 (-3.01-5.87)	5.18	No
Depression	41.0 (41.0-52.2)	41.0 (41.0-69.5)	.74	-0.72 (-4.33-2.89)	-1.27 (-5.09-2.55)	4.46	Yes
Fatigue	55.2 (48.6-64.7)	52.5 (48.6-57.2)	.21	-3.22 (-7.11-0.67)	-2.97 (-7.11-1.18)	5.07	Yes
Sleep disturbance	51.1 (46.4-56.2)	49.8 (46.4-55.4)	.60	-0.78 (-3.93-2.37)	-0.54 (-3.87-2.78)	3.67	Yes
Social function	49.9 (43.3-54.7)	51.8 (45.2-58.3)	.15	3.27 (-0.74-7.29)	3.03 (-1.25-7.31)	5.13	Yes
Pain interference	55.7 (53.9-61.3)	55.7 (53.9-61.3)	.61	-1.41 (-4.71-1.89)	-2.21 (-5.68-1.25)	4.14	Yes
Secure Flourish Index, median (IQR)	101.0 (91.5-109.0)	97.0 (82.5-105.5)	.25	-2.73 (-10.76-5.30)	-1.25 (-9.67-7.16)	10.19	Yes

†Mean differences are calculated from control scores subtracted from POINT scores.
‡Adjusted for differences in independent covariates (age and surgical procedure) between control and POINT groups.
*The noninferiority margin is the MCID, which is defined as 0.5 times the control group standard deviation. Noninferiority is established if the lower bound of 95% CI does not exceed the MCID for SFI and physical and social function PROMIS domains (higher scores reflect better HRQOL) and if the upper bound of 95% CI does not exceed the MCID for the remaining PROMIS domains (higher scores reflect worse HRQOL).

Abbreviations: POINT, postoperative opt-in narcotic treatment; CI, confidence interval; MCID; minimal clinically important difference; HRQOL, health-related quality of life; PROMIS, Patient-Reported Outcomes Measurement Information System; IQR, interquartile range

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eTable 2. Subgroup superiority analysis of daily patient-reported postoperative pain scores and health-related quality of life assessment in POINT patients

	POINT-In (n=23)	POINT-Out (n=25)	*P* value
Pain Scores			
Patients with >5 surveys completed, n (%)	23 (100.0)	24 (96.0)	
Daily peak pain scores, median (IQR)			
POD 1	7 (5-8)	5 (4-7)	.01
POD 2	6 (4-7)	4 (3-6)	.02
POD 3	5 (3-5.5)	3 (1.8-4)	.01
POD 4	3 (2.3-4.8)	2 (1-3)	.04
POD 5	2 (1.3-4)	2 (1-3)	.38
POD 6	2 (1-3)	2 (1-2.3)	.18
POD 7	2 (1-3)	1 (0-2)	.03
HRQOL			
Patients with HRQOL assessment completed, n (%)	21 (91.3)	22 (88.0)	
PROMIS-29 v2.0 T-scores, median (IQR)			
Physical function	44.7 (41.2-47.6)	44.9 (41.4-56.9)	.40
Anxiety	56.2 (54-63.2)	49.8 (40.3-53.8)	.001
Depression	48.9 (41-54.1)	41 (41-48.9)	.23
Fatigue	51.2 (48.6-57.2)	53.2 (48.6-56.6)	.92
Sleep disturbance	49.8 (46.4-56.2)	50.4 (47.7-54.5)	.86
Social function	52.2 (44.2-55.8)	51.8 (46.3-62.7)	.92
Pain interference	55.7 (55.7-61.5)	54.6 (41.6-57)	.01
Secure Flourish Index, median (IQR)	96 (75-103)	98.5 (89.3-106.8)	.35

[†]Absolute differences are mean differences of control scores subtracted from POINT scores. Noninferiority is established if the upper boundary of the 1-sided 95% CI is less than 2.
[‡]Adjusted for differences in independent covariates (age and surgical procedure) between control and POINT groups.

Abbreviations: POINT, postoperative opt-in narcotic treatment; IQR, interquartile range; CI, confidence interval; POD, postoperative day

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eTable 3. Univariate and multivariate analyses of factors associated with opting in for postoperative opioids amongst POINT patients

Variable	POINT-In (n=23)	POINT-Out (n=25)	Univariate *P*	Multivariate OR (95% CI)	Multi-variate *P*
Age, y	46 (39-57)	46 (41-61)	.59		
BMI, kg/m^2	27.6 (24.5-30.3)	23.7 (21.6-28.7)	.06		
Male	5 (21.7)	6 (24.0)	>.99		
History of prior narcotic use	20 (87.0)	12 (48.0)	.006	7.51 (1.61-50.11)	.02
Positive PHQ-2	7 (30.4)	7 (28.0)	.10		
Preoperative cancer diagnosis	9 (39.1)	5 (20.0)	.21		
Surgical procedure					
Parathyroidectomy[†]	5 (21.7)	11 (44.0)			
Thyroid lobectomy	12 (52.2)	8 (32.0)	.09		
Total thyroidectomy	6 (26.1)	6 (24.0)	.32		
Operative time, minutes	76 (65.5-116)	84 (63-99)	.92		
Incision length, cm	4 (3.5-4)	3 (2.5-4)	.06		
Overnight stay	9 (39.1)	11 (44.0)	.78		
Inpatient OME given	68 (49.1-84.5)	46 (30-61)	.01	1.02 (0.99-1.05)	.21
Inpatient postoperative pain score					
4-hour postoperative pain	3 (2-4)	0 (0-2)	.01		
Last recorded pain	3 (1.5-4)	0 (0-2)	.002	1.68 (1.15-2.68)	.01
Highest postoperative pain	7 (5.5-8)	3 (0-6)	.001		

Univariate analyses represented as median (IQR) or n (%)
[†]Reference variable
Abbreviations: POINT, postoperative opt-in narcotic treatment; OR, odds ratio; CI, confidence interval; BMI, body mass index; PHQ-2, Patient Health Questionnaire-2; OME, oral morphine equivalents

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eAppendix 1: Phone enrollment and consent script

Hello _____,

This is ___ from the UCLA endocrine surgery center. I work with Dr. ___'s research team. I know Dr. ___ mentioned that we are doing a research study on pain treatment. Do you have 10-15 minutes to discuss?

The forms you received in clinic contain the details of the informed consent, which I'm going to go through now so you can decide if you'd like to participate. We are doing a randomized controlled study on postoperative pain treatment. First, have you ever had narcotic pain medications before? In what context did you take them (after procedure, chronic pain)? (if chronic pain – Do you believe you have ever taken them for longer than 90 consecutive days?) For our study, participants will be randomized to one of two treatment arms. One study arm is the "usual care" treatment arm. This is what we do with all patients normally, which is to automatically provide you with a prescription for with 10 pills of hydrocodone-acetaminophen (aka Norco) after surgery. This is a narcotic or opioid pain medication, which is very effective to treat pain, but you will not be obligated to take the medication; the prescription is there for you if you need it.

The other study arm is enrollment in the POINT program, also known as postoperative opt-in narcotic treatment. With this program, we would ask that you decide after your surgery, before your discharge, if you would like to receive a prescription for Norco. Essentially, you would need to opt in to receive the prescription instead of being prescribed it automatically. The purpose of the study to is see how patient pain levels are after surgery depending on the medications taken. Regardless which study arm you are randomized to and whether or not you opt in, you are not obligated to take any particular medication. You may choose to take over the counter medications or narcotic pain medications, depending on your level of pain.

After surgery, we will send you daily surveys for 7 days through an iPhone app called PRIME for Patients to assess your pain levels. The survey should only take 1-2 minutes each day, with a handful of questions about your pain levels and what pain medications you took. If you don't have an iPhone, we can email you the surveys instead (unfortunately an Android version is not currently available). If your pain levels are abnormally high (8-10), the app will send a notification to us and a doctor will contact you within 24 hours to check in.

Risks of participating in this study are minimal, but they include the possibility of slightly higher pain levels if you are in the opt-in program and you do not opt in to receive a prescription pain med. However, you'll be provided with a contact number that you can contact 24/7 to request a prescription sent to the pharmacy of your choice, if you need it, no questions asked. There is also a small privacy risk of your health information, but we take care to protect your electronic health information as best we can with data encryption and limiting the number of people that handle your patient records. Benefits include closer monitoring of your pain levels through the PRIME app that patients otherwise do not receive, and if you have excessive pain, someone will check in with you. Also, if you do participate and fill out all daily surveys, we have a $50 Amazon gift card that we would send you as a token of our appreciation. But we do require that you fill out all surveys within 24 hours of receiving them.

Please tell me what questions you have and if you would be interested in participating.

Randomized to routine prescription: You have been randomized to the "usual care" treatment arm, which means your surgeon will provide you with a prescription for Norco after surgery. Again, you can choose to take the narcotic medication depending on your pain levels, or just take over the counter medication like Advil or Tylenol if you don't need it. Please remember to read all instructions on the container. For ibuprofen, you should not take it if you have kidney disease or a history of GI bleed. For Tylenol, you may not take more than 3000 milligrams total per day, which includes the amount of acetaminophen included in Norco, which contains 325 mg per pill.

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Ok now, I will walk you through download of the PRIME app. First of all, do you have your myUCLAhealth account and MyChart set up? Go to the App store and type in PRIME for Patients and download the first app that comes up.

Please bring your smartphone of the day of surgery, so we can verify that PRIME is working.

Randomized to POINT: You have been randomized to POINT, the opt-in program. This means that just prior to your discharge from the surgery center, you will be asked if you would like to opt-in to receive a prescription for opioids. You'll be given a form to sign, and you'll just mark either yes, I agree to receive a prescription, or no I don't want a prescription right now. In order to make an informed decision, I'm going to go over some information about pain treatment for you. The reason we started this study is that a recent study published last year found that in patients who underwent outpatient thyroid/parathyroid surgery who were given the choice to receive a prescription, similar to the choice we are asking of you after your surgery, 94% of patients opted to go home with just over the counter pain medication treatment and no patients subsequently called in later to ask for a prescription.

We don't know if these patients were having a lot of pain at home without the narcotic medication, but we think most likely not, since they didn't call in later for a prescription. In order to evaluate pain levels in detail, we are going to be monitoring remotely with the PRIME surveys or daily phone calls. Some patients do have significant pain and require narcotic pain medication to get their pain under control, but we want to make sure we prescribe these potent medications only to those who really need it. There are significant side effects, such as nausea, vomiting, drowsiness, and there is a small possibility of chronic narcotic dependency, since it's an addictive substance. While most patients who take opioids for surgical pain only require it for a short period of time, there was another study published a couple years ago that found 7% of patients who were prescribed opioids for the first time after surgery were still taking them 90 days later.

We usually recommend that patients take over the counter medication such as ibuprofen or acetaminophen prior to taking the prescription, Norco. Please remember to read all instructions on the container. For ibuprofen also known as Advil or Motrin, you should not take it if you have kidney disease or a history of GI bleed. For acetaminophen, you may not take more than 3000 milligrams total per day, which includes the amount of acetaminophen included in Norco, which contains 325 mg per pill. You can alternate these two medications every three hours, so a dose of acetaminophen followed by a dose of ibuprofen three hours later, and then acetaminophen again 3 hours later, etc. You can also put an ice pack on your neck. These detailed pain treatment strategies will be provided to you on discharge.

So, before your discharge from the surgery center, we will ask you to make a decision if you would like to go home with a prescription or not, and before making your decision, you will watch a short 2-3 minute video beforehand, reviewing the information I just went over.

Ok now, I will walk you through download of the PRIME app. First of all, do you have your myUCLAhealth account and MyChart set up? Go to the App store and type in PRIME for patients and download the first app that comes up.

Please bring your smartphone of the day of surgery, so we can verify that PRIME is working.

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eAppendix 2: POINT Program Discharge Video Script

Thank you again for participating in this important research at UCLA. You are helping us in our pursuit to provide the best patient care possible.

You have recovered well from surgery and are ready to return home. Now, we need you to make an important decision: whether you would like us to prescribe you narcotic pain medication to take home.

To help you make this decision, we want to reiterate just 3 things.

One, narcotic pain medications, also known as opioids, are powerful medications that are useful for controlling pain. Side effects include nausea, vomiting, constipation, and feeling "loopy" or intoxicated. There is also a small but real risk of dependency. Research has shown that about 1 in 16 people become chronic users of narcotic medication after being prescribed opioids for postoperative pain. We understand some patients do need narcotics to control their pain, but we want to be more diligent about only giving narcotic prescriptions to patients who need them.

Two, in recent scientific studies on the same neck surgery you had, more than 90% of patients chose to go home with only Tylenol for pain control. None of those patients experienced enough pain to call in and ask for narcotics after their discharge. Because you have just had surgery, there will be a certain expected level of pain from the incision as well as throat pain from the breathing tube for a few days after surgery. The pain is usually the worst on the second day and gets better from there. Try using an ice pack on your neck for 20 minutes every 3-4 hours for the first two days after surgery to reduce inflammation. You may take over-the-counter Tylenol to help treat the pain. Please only take as directed in the instructions. If you need additional over-the-counter pain medication, you can take ibuprofen in between doses of Tylenol. These drugs do not interact, so it is okay to take both. You will be provided with paperwork detailing potential pain treatment strategies to take at home, which can be easily obtained from your local pharmacy.

Three, if you choose to go home without narcotics, you will be given a contact number to call if you experience uncontrolled pain or changed your mind for any reason, available 24/7. You will have a prescription called into your pharmacy at your request.

So, please take a moment to consider your level of pain right now. Would you like to have a narcotic prescription to go home with?

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eAppendix 3: Daily postoperative survey questions

Question 1.
On a scale of 0-10 (0 = no pain, 10 = worst pain imaginable), what was your HIGHEST level of pain today?

Question 2.
On a scale of 0-10 (0 = no pain, 10 = worst pain imaginable), what was your AVERAGE level of pain today?

Question 3.
Where is the pain? Select any of the following:
Answers: Neck surgical incision site, sore throat, headache, shoulder, back, other

Question 4
Did you take any narcotic (opioid) pills today for pain in the last 24 hours?
Answers: Yes, No

Question 4a.
How many prescribed narcotic (opioid) pills did you take today?

Question 5.
Which of the following over-the-counter pain relievers did you take in the last 24 hours?
Answers: acetaminophen (Tylenol) 325 mg, acetaminophen (Tylenol) 500 mg, ibuprofen (Advil, Motrin) 200 mg, naproxen (Aleve) 200 mg, other

Question 5a.
[If acetaminophen (Tylenol) 325 mg] How many pills of acetaminophen (Tylenol) 325 mg did you take in the last 24 hours?

Question 5b.
[If acetaminophen (Tylenol) 500 mg] How many pills of acetaminophen (Tylenol) 500 mg did you take in the last 24 hours?

Question 5c.
[If ibuprofen (Advil, Motrin) 200 mg] How many pills of ibuprofen (Advil, Motrin) 200 mg did you take in the last 24 hours?

Question 5d.
[If naproxen (Aleve) 200 mg] How many pills of naproxen (Aleve) 200 mg did you take in the last 24 hours?

Question 5e.
[If other] Please describe the name, dose, and number of pills taken of the other over-the-counter pain medication you took in the last 24 hours.

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