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Ten years of transitional pain service research and practice: where are we and where do we go from here?

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ABSTRACT

Chronic postsurgical pain (CPSP) is a prevalent yet unintended consequence of surgery with substantial burdens to the individual and their family, the healthcare system, and society at large. The present article briefly reviews the evidence for transitional pain services (TPSs) that have arisen in an effort to prevent and mange CPSP and persistent opioid use, and provides an update on recent novel risk factors for CPSP. Available evidence from one randomized controlled trial (RCT) and three non-randomized cohort studies suggests that TPS treatment is associated with better opioid use outcomes, including fewer opioid tablets prescribed at discharge, better opioid weaning results, a lower incidence of new-onset chronic opioid use, and lower consumption of opioids even at later time points up to 1 year after surgery. Another RCT indicates TPS treatment can be enhanced by provision of perioperative clinical hypnosis. While these preliminary studies are generally positive, large-scale, RCTs are needed to provide a more definitive picture of whether TPSs are effective in reducing opioid consumption and improving pain and mental health outcomes in the short and long term. With the expansion of TPSs across North America and globally, perioperative care focused on reducing the transition to pain chronicity has the potential to help millions of patients. With additional evidence from well-controlled RCTs, TPSs are well poised to continue to evolve and strengthen the role of multidisciplinary care teams in the immediate postdischarge period and beyond.

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BACKGROUND

The Toronto General Hospital Transitional Pain Service (TGH-TPS) was designed to proactively identify patients at high risk of developing chronic postsurgical pain (CPSP) and persistent opioid use through assessment and multidisciplinary intervention across the perioperative period. The TGH-TPS aims to deliver multiprofessional pain care to patients with complex health issues for up to 6 months following surgery. Patients undergo risk factor screening for both physical and mental health issues and are recommended for further assessment if they have a background of anxiety, depression, significant levels of catastrophic thinking about pain, preoperative opioid use, and/or pre-existing chronic pain. Patients at the greatest risk of developing CPSP and engaging in persistent, high-dose opioid use are offered increased clinical resources to manage postsurgical pain.

In the first part of this paper, we will briefly review the evidence for the efficacy of TPSs in reducing opioid use in the short and long term after a variety of surgical procedures. In doing so, we refer to TPSs, in general, using the abbreviation TPS to denote research not specifically tied to one institution; otherwise, we will use the name of the specific program to make it clear when we are referring to a specific TPS (eg, TGH-TPS). This is not an exhaustive review of all programs designed to proactively address the problems of CPSP and persistent opioid use; rather the review focuses specifically on research addressing these problems by TPSs. In the second section, we describe recent evidence from the TGH-TPS for novel risk factors for CPSP and how these may impact TPS effectiveness. We also describe the integration of the mobile app, Manage My Pain into the TGH-TPS as well as its usefulness in ongoing research activities. We conclude with recommendations for future research and clinical activities related to the prevention and management of CPSP, in particular, two ongoing projects, one involving a digital health solution focusing on the provision of psychological interventions for pain clinics that do not have a dedicated psychologist and the other, a psychological intervention aimed at modifying a specific type of memory

for pain that has been shown to be a risk factor for CPSP up to 1 year after surgery.

TORONTO GENERAL HOSPITAL TRANSITIONAL PAIN SERVICE

The TGH-TPS[1 2] was established in 2014 to address the problem of CPSP with a seamless approach to perioperative pain care and opioid use by a multidisciplinary team. Patients are assessed and managed across the perioperative care pathway, in some cases, as early as the preoperative visit. Treatment is provided in hospital after surgery and continued for ideally up to 6 months in an outpatient setting after patients have been discharged home. The TGH-TPS offers treatment to high-risk patients scheduled for major surgical procedures for cancer (eg, thoracic, breast, gastrointestinal, head and neck), cardiac disease (eg, coronary artery bypass graft, heart valve repair), and organ transplantation (eg, kidney, lung, liver, heart, pancreas). Recently, these indications have been extended given requests from neighboring hospitals within the University Health Network system. The Toronto Western Hospital has also launched a TPS in the past year with a focus on orthopedic and spine surgery. The TGH-TPS has three main goals: (1) to provide comprehensive pre and postoperative pain care for patients who are at high risk of developing CPSP and pain disability, (2) to manage in-hospital opioid use and help patients to wean off opioids after hospital discharge, and (3) to help patients cope and improve functional activities across the perioperative trajectory. The multidisciplinary team at the TGH-TPS provides multimodal medication optimization by anesthesiologists trained in pain medicine, postsurgical acute pain care by nurse practitioners and advanced practice nurses, physical therapy and acupuncture by physical therapists, mind-body/psychological interventions by pain psychologists trained in pain education, mindfulness-based approaches, clinical hypnosis, acceptance and commitment therapy (ACT) and more traditional cognitive–behavioral therapy, and more recently a psychiatrist with expertise in chronic pain, substance use disorders, and other concurrent psychiatric illnesses. The TGH-TPS also has an administrative assistant and a patient care coordinator. A common thread that runs through TGH-TPS research and clinical activities has been a partnership with ManagingLife, a technology startup company whose digital solution, Manage My Pain, allows patients to efficiently track their pain and functional activity on a daily basis using an Android or Apple smartphone or a mobile or desktop browser.[3] Manage My Pain also serves as the hub through which questionnaires are administered to users for both clinical and research purposes.[4 5]

TPS: LITERATURE SEARCH

The first publication[1] describing the development and implementation of the TGH-TPS provided a blueprint for other institutions that were interested in advancing a TPS for children[6] and adults.[7–10] Other similar clinics and services have since emerged, including the enhanced recovery after surgery approach,[11] Acute Pain Service Out-Patient Clinic,[12] Johns Hopkins Personalized Pain Program,[13] Vanderbilt TPS,[14] Duke Transitional Pain Services,[15] Perioperative Pain Management, Education, and De-escalation service,[16] and the POET-Pain TPS.[17]

To evaluate the extent to which TPSs, in general, have penetrated the scientific and clinical academic literature, we searched the PubMed National Library of Science for journal articles published in peer-reviewed journals between 2015 and March 2024 containing "transitional pain service" OR "transitional pain clinic" in the title or abstract (March 8, 2024). This search yielded 71 published articles which we retrieved and downloaded. Next, we searched the Clarivate Web of Science for published articles that cited the foundational articles by Katz *et al*[1] (March 14, 2024) and Huang *et al*[2] (March 16, 2024), the former yielding 156 articles after removing duplicates and the latter yielding an additional 43 articles after removing duplicates. This resulted in a total of 270 published articles. Figure 1 shows an increasing yearly and cumulative yearly number of published articles that mention TPS and provides an indication of the international interest and research addressing the twin problems of chronic pain and persistent opioid use after surgery.

TPS: assessing the evidence for efficacy

Of the 270 articles identified through the literature search, 16 articles with a total of 4173 patients evaluated some aspect of TPS management. Table 1 shows a summary of the 16 studies listing the study design, population recruited, sample size, when participants were admitted to the TPS relative to surgery, a description of the nature of TPS treatments received, length of time under TPS care, pain, opioid, and/or mental health outcomes measured, and highlights of the main results. The 16 articles comprised 3 randomized controlled trials (RCTs),[7 18 19] 3 non-randomized, 2-group cohort studies that compared a TPS group with a non-TPS matched control group[20] or a historical control group,[21 22] 5 single group, retrospective, longitudinal cohort studies,[13 23–26] 4 single group prospective, longitudinal cohort studies,[5 27–29] and 1 cross-sectional survey assessing treating physicians' satisfaction working within a TPS.[7]

Given the space limitations, we will describe the four studies that compared patients seen by a TPS with control patients not seen by a TPS. We will also present the primary and secondary outcomes of an RCT that evaluated the added benefit of an intervention over-and-above TPS treatment (eg, TPS+ hypnosis vs TPS+ treatment-as-usual (TAU)).[18 19] The remaining studies in table 1 will not be reviewed in this section since they do not evaluate the comparative efficacy of a TPS, being either single group cohort studies describing patients or subsets of patients seen by a TPS over time,[5 13 23–29] or a satisfaction survey.[7]

RCT comparing TPS-treated and non-TPS-treated patients

A single RCT evaluated the efficacy of a TPS in improving quality of life (QoL) on the third day after surgery as the primary outcome, as well as on secondary outcomes, including opioid consumption, pain severity, and subjective satisfaction 3 and 6 months after surgery.[7] 176 patients scheduled for a variety of elective surgeries were randomly assigned to a multidisciplinary TPS group or a standard of care (SOC) group and followed up at 3 and 6 months after surgery. The results did not show a significant difference between the groups in the primary outcome measure, QoL on the third postoperative day. Data for the secondary outcomes are provided in tabular form and appear to favor the TPS group over the SOC group in terms of 6-month opioid consumption, new-onset disability, and incidence of chronic pain at 6 months, but the authors did not conduct statistical analyses comparing the groups.

Non-randomized, cohort studies comparing TPS-treated and non-TPS-treated patients

Three non-randomized studies compared TPS patients with non-TPS controls. Buys *et al*[22] compared 164 TPS patients with 176 historical controls who underwent orthopedic surgery at the same institution but 1 year before the TPS had been established. The two groups were similar in baseline characteristics

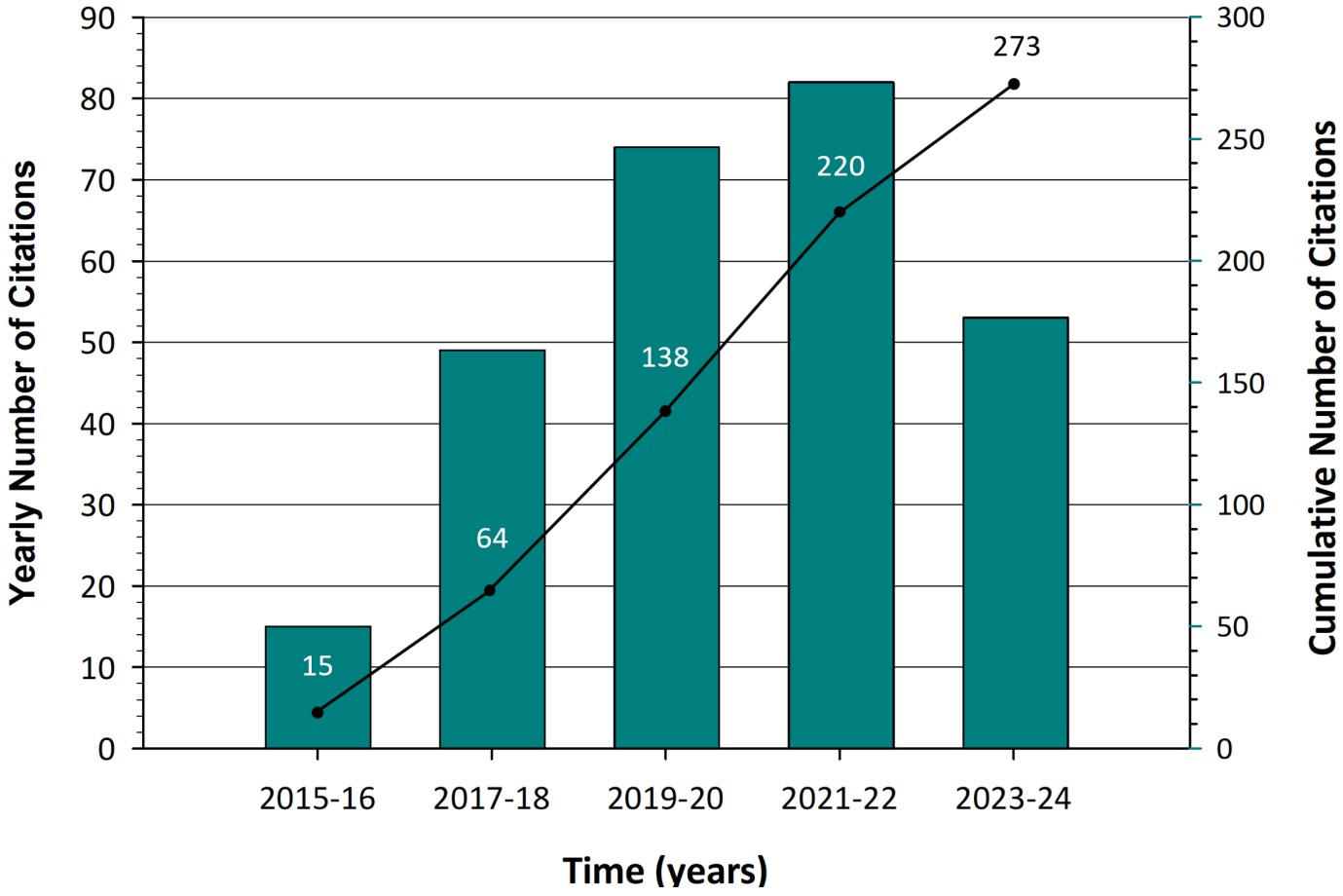

Figure 1 Yearly number and cumulative yearly number of published articles since 2015 retrieved from a March 8, 2024 title and abstract search of PubMed Central for "transitional pain service" or "transitional pain clinic", and a March 14, 2024 and March 16, 2024 search of Clarivate Web of Science for published articles citing the article by Katz *et al*[1] and Huang *et al*,[2] respectively. Each green bar represents the number of citations in that year (left y-axis). The filled black circles and the numbers above them are the cumulative yearly number of citations (right y-axis).

including demographic variables and surgical procedures. Analysis of the primary outcome showed that 90 days after surgery, TPS patients (13.4%) were significantly less likely to be taking opioids than the non-TPS historical control group (27.3%). Analysis of secondary outcomes indicated that the number of opioid tablets prescribed at hospital discharge was significantly lower for the TPS group than the control group. The percentage of patients who were opioid-naïve prior to surgery and developed new onset of chronic opioid use (defined as still using after 90 days) was significantly lower in the TPS group (0.7%) than the controls (8.4%). Similarly, among patients who were using opioids before surgery, a significantly greater percentage of TPS (67.5%) patients than controls (45.3%) were off opioids or had reduced opioid use at the 90-day time point. Pain and mental health outcomes were measured for patients in the TPS group, but these results were not available for the historical controls.

Featherall *et al*[21] compared 137 opioid-naïve patients undergoing primary total joint arthroplasty at a Veterans Affairs Medical Center who received TPS treatment with 71 historical controls who underwent similar surgery at the same institution prior to the establishment of the TPS. The two groups were similar in baseline characteristics including demographic variables and surgical procedures with the exception that a greater proportion of patients in the TPS group versus the control group had been diagnosed with an anxiety disorder. Analysis of the primary outcome showed that the percentage of patients with persistent opioid use at 90 days postdischarge was significantly greater in the historical control group (9.9%) than in TPS group (0.07%). In univariable and multivariable analyses, the mean number of tablets prescribed in the 90-day postdischarge period for the TPS group (n=49) was significantly lower than in the historical control group (n=119). Pain and mental health outcomes were measured for patients in the TPS group, but these results were not available for the historical controls.

Ladha *et al*[20] compared a sample of 209 TPS patients with a matched cohort of 209 non-TPS treated patients from other hospitals using administrative data. The two cohorts were matched 1:1 without replacement on mean past 90-day opioid daily dose in MME (0, 1–59, >60), sex, age group in years (18–34, 35–49, 50–64, and ≥65), income quintile, discharge date ±5 years, and surgery type. The primary outcome was postoperative, pharmacy-dispensed opioid use (MME) in the 12 months after hospital discharge. Over the 12-month period after surgery, both groups showed a significant decrease in MME with the TPS group decreasing by 3.53 MME per month compared with a decline of 1.05 MME for the control group. The mean difference (2.48 MME) in the reduction of monthly opioid use between the TPS group and the control group was significant indicating a greater decrease in opioid use in the former than the latter group. A second matched cohort that underwent surgery at the same institution but did not receive TPS treatment was compared with a new TPS group with the pattern of results being the same as the main analysis. The mean daily MME per

Table 1 Summary of the 16 articles identified through the literature search, showing the author and year of publication, study design, population recruited, sample size, when participants were admitted to the TPS relative to surgery, a description of the nature of TPS treatments received, length of time under TPS care, primary outcome measures, and highlights of the main results

Author/year	Design	Population	Sample size	Time of admission to TPS	Nature of TPS treatment	Duration of TPS treatment	Primary and/or pain outcome(s)	Main results
Admiraal *et al* 2023[30]	Randomized controlled trial (RCT)	Individuals undergoing elective surgery with an increased risk of CPSP.	Of the 176 who consented and were included in analyses, n=92TPS, n=84 Standard of care (SOC).	Patients identified as being at risk for chronic postsurgical pain (CPSP) were admitted to the TPS following their assessment for eligibility before surgery. The TPS took over pain management responsibilities during the hospital stay and continued follow-up postdischarge.	This multidisciplinary service included nurse practitioners, acute and chronic pain specialists, and a consulting pain psychologist. The TPS provided a four-step approach for at-risk patients, involving tailored pharmacological/interventional plans, patient empowerment, education on pain management, and shared decision-making. The TPS managed pain care during the hospital stay and continued follow-up after discharge.	During hospital stay; postdischarge follow-up: Patients were contacted by the TPS on days 4 and 14 after hospital discharge. If necessary, follow-up continued every 2 weeks for the next 6 weeks. After this, patients received monthly check-ups for the remaining 4 months.	Primary outcome: Quality of Recovery: Measured using the QoR-15 questionnaire on postop day 3, focusing on pain aspects. Pain outcomes: CPSP: Incidence of CPSP postop at 3 months and 6 months, categorizing patients into three groups based on their pain status after surgery: -New CPSP (no chronic pain presurgery, new CPSP at follow-up) -Persisting pain in the surgical area (chronic pain presurgery and still present) -No chronic pain in the surgical area (no chronic pain after surgery).	QoR-15 on Day 3 postop did not differ significantly between TPS and SOC groups. At 3 and 6 months postop: persistent pain in n=23TPS vs n=30SOC, patients and n=14TPS vs n=25 SOC patients, respectively. At 3 and 6 mo postop: pain-free in n=66TPS and n=47SOC patients, and n=71TPS and n=52SOC patients respectively. At 3 and 6 mo postop, median reduction in chronic opioid use was −30 milligrams of morphine equivalents (MME) in TPS vs 0 MME in SOC and −29.3 MME and 0 MME, respectively. Incidence of new-onset disability at 3 and 6 months: 16.7% in TPS and 24.4% in SOC and 9.8% in TPS and 16.7% in SOC, respectively. Patient satisfaction and WHODAS 2.0 scores appeared comparable between groups.

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Table 1 Continued

Author/year	Design	Population	Sample size	Time of admission to TPS	Nature of TPS treatment	Duration of TPS treatment	Primary and/or pain outcome(s)	Main results
Admiraal *et al*, 2023[7]	Survey after an RCT	Anesthetists and anesthesia residents involved in TPS implementation.	36 physicians from the Department of Anesthesiology returned the satisfaction survey after four rounds of distribution.	NA	The TPS involved a multidisciplinary team of clinicians who developed a patient-tailored pharmacological and/or interventional pain management plan. This care was focused on: Reducing acute pain, preventing the transition to chronic pain (CPSP), assisting in tapering opioids when necessary, improving coping and functioning despite remaining pain.	The TPS was designed to start providing care before surgery and continue until months after the patient was discharged from the hospital.	8-item satisfaction survey developed by the authors. Satisfaction survey questions covered 8 dimensions: accessibility, advice, communication, times savings, feasibility, improvement in care, loss of control, and future existence of the TPS. Satisfaction was measured using a Likert scale with five response options from never (1 point) to always (5 points).	1. Accessibility: three (8.3%) participants could not easily reach the TPS after a patient was identified. 2. Advice: four (11.1%) could not easily retrieve advice discussed during the multidisciplinary TPS meeting. 3. Communication: 28 (84.1%) were satisfied with TPS team communication. 4. Timesaving: 23 (63.9%) reported the TPS was time-saving. 5. Feasibility: 9 (80.5%) reported that the advice given by the TPS was feasible. 6. Patient care: 30 (81.0%) reported that patient care had improved with the TPS. 7. Control: 25 (69%) reported that they retained control of patient care. 8. Continuation: 33 (86.8%) wanted to see the TPS continued in the future.
Azam *et al*, 2017[23]	Retrospective, longitudinal cohort study	Patients undergoing major surgery	343 patients who attended TPS were compared based on Acceptance and Commitment Therapy (ACT) delivery: n=91 ACT n=252 no ACT	Patients were referred to the TPS at 3 time points: 1. presurgery 2. postsurgery in-hospital 3. after hospital discharge	All patients received treatment from the TPS. In addition, some also received a psychological intervention, ACT delivered by a registered clinical psychologist or supervised clinical psychology graduate students. The ACT approach focused on reducing struggle against pain while fostering long-term behaviors aimed at building a fulfilling life. Others did not receive the ACT intervention.	ACT sessions were provided after postsurgical hospital discharge and lasted approximately 45 min each, with patients encouraged to practice mindfulness at home for 10 min per day. ACT and no ACT groups engaged with the TPS for an average of 22.1 and 10.4 weeks after postsurgical hospital discharge, respectively.	Pain outcomes: Brief Pain Inventory–Short Form (BPI-SF) pain severity and pain interference scales. Mental health outcomes: - Hospital Anxiety and Depression Scale (HADS)-A (Anxiety)) and depression (HADS-D (Depression)) - Sensitivity to Pain Traumatization Scale (SPTS) - Pain Catastrophizing Scale (PCS)	ACT group reported more mental health conditions preoperatively, had higher opioid use at the first postsurgical visit, and higher SPTS and HADS-A scores than the no ACT group at both the first and last TPS visits. Both groups showed reductions in BPI-pain severity, BPI-pain interference, PCS, HADS-A and opioid use by the last TPS visit, but the ACT group showed greater reductions in opioid use, BPI-pain interference, and HADS-D by the end of treatment compared with the no ACT group.

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Table 1 Continued

Author/year	Design	Population	Sample size	Time of admission to TPS	Nature of TPS treatment	Duration of TPS treatment	Primary and/or pain outcome(s)	Main results
Buys *et al*, 2020[22]	Retrospective, longitudinal cohort study	Surgical patients scheduled to undergo primary or revision total knee, hip, or shoulder surgery or rotator cuff surgery, based on the risk for CPSP and chronic opioid use (COU).	336 (164 TPS, 172 no TPS, historical controls)	Patients are identified for enrollment in TPS when they are scheduled for elective surgical procedures.	The TPS intervention consists of comprehensive pain management and care coordination by a multidisciplinary team, including anesthesiologists, nurse practitioners, nurse care coordinators, and psychologists. Treatments include: Preoperative education and assessment; Development of individualized perioperative pain management plans; Mindfulness-Based Intervention and ACT; Implementation of Enhanced Recovery After Surgery protocols, including non-steroidal anti-inflammatory drugs, acetaminophen, gabapentinoids, and regional anesthesia.	TPS engagement of patients occurs during the preoperative period, surgical hospitalization, and the postoperative recovery period for up to 6 months.	Primary outcome: proportion of patients taking opioids 90 days after surgery. Pain Outcomes: Baseline patient-reported pain measures using Patient Reported Outcome Measurement Information System (PROMIS) instruments. Follow-up telephone calls recorded pain-related data.	Primary outcome: 90 days after surgery, TPS patients (13.4%) were significantly less likely to be taking opioids than the non-TPS historical control group (27.3%) A significantly greater percentage of TPS (67.5%) patients than no TPS patients (45.3%) were off opioids or had reduced opioid use at the end of the study Pain outcomes: not reported Mental health outcomes: not reported
Buys *et al*, 2023[24]	Retrospective, longitudinal cohort study	Veterans who underwent orthopedic surgery. Includes Individuals who received primary or revision total hip, knee, or shoulder arthroplasty as well as those receiving rotator cuff repair and any other patient having other types of orthopedic surgery with a history of substance abuse disorder.	N=448 (371 discharged home with TPS follow-up, 77 discharged to a skilled care facility)	Before surgery.	Treatment involved comprehensive pain management and care coordination through the TPS which included preoperative education, in-hospital care, and postdischarge follow-up. The care was delivered by a multidisciplinary team, including anesthesiologists, nurse practitioners, care coordinators, and psychologists.	Preoperative education and care occurred before surgery, followed by in-hospital care during the surgical hospitalization. Postdischarge follow-up included calls on days 2, 7, 14, 21, 30, 60, and 90, indicating ongoing support for at least 90 days after discharge.	Primary outcome: number of days to cessation of opioids after discharge from hospital. Pain outcomes were measured using the PROMIS for pain intensity (PROMIS 3a) and pain interference (PROMIS 6b) obtained prior to surgery.	Primary outcome: In univariable and multivariable models, the percentage of patients discharged to skilled care (4%) who continued to use opioids in the past 90 days after discharge from the hospital was significantly greater than the percentage of patients discharged home with TPS follow-up (0%). Pain outcomes: not reported. Mental health outcomes: Percentage of patients with Posttraumatic Stress Disorder significantly higher in patients discharged home with TPS follow-up (28%) than to skilled care facility (17%). Other mental health conditions did not differ significantly between groups.

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Table 1 Continued

Author/year	Design	Population	Sample size	Time of admission to TPS	Nature of TPS treatment	Duration of TPS treatment	Primary and/or pain outcome(s)	Main results
Clarke *et al*, 2018[25]	Retrospective, longitudinal cohort study	Patients undergoing major surgery	N=251 consenting patients ≥18 years seen by the TPS divided into opioid use status prior to surgery: opioid-naïve and opioid experienced.	Patients referred to the TPS from 3 time points: 1. presurgery (n=51) 2. postsurgery in-hospital (n=119) 3. after hospital discharge (n=81)	TPS consists of a interdisciplinary team of nurse practitioners, physicians, psychologists, and other allied health professionals who work to identify and minimize the risk of CPSP, maintain function, and reduce risk of persistent opioid use after surgery.	TPS treatment was delivered for a total of 6 months for the entire sample and with an average of 6 visits to the TPS.	Primary outcomes: 1. Duration of opioid therapy posthospital discharge . 2. Rate of opioid weaning for opioid-naïve and opioid-experienced patients from hospital discharge to last TPS visit 6 months later after TPS treatment in mg morphine equivalent (MME) Secondary outcomes: 1. pain severity and pain interference at hospital discharge and 6 months later 2. Predictors of opioid weaning	Primary outcomes: 1. Duration of opioid therapy for the two groups did not differ significantly with 5.24 months for the opioid-naïve and 6.61 months for the opioid-experienced patients. 2. Six months after surgery, 49 (44.5%) opioid-naïve patients 35 (25.6%) opioid-experienced had been successfully weaned to 0 MME/day. For opioid-experienced patients, lower PCS scores at baseline, lower levels of neuropathic pain scores, and a positive history of recreational drug use significantly predicted percentage reduction in MME from hospital discharge to the last TPS visit whereas only opioid use at hospital discharge predicted MME reduction for opioid-naïve patients. Pain Outcomes: Pain severity and pain interference levels were reduced significantly in both groups from hospital discharge to the last TPS visit. Mental health outcome: Anxiety (HADS-A) and depression (HADS-D) scores did not differ significantly between the groups at the last TPS visit

Continued

Table 1 Continued

Author/year	Design	Population	Sample size	Time of admission to TPS	Nature of TPS treatment	Duration of TPS treatment	Primary and/or pain outcome(s)	Main results
Featherall *et al*, 2022[21]	Prospective, longitudinal study comparing TPS patients with historical controls (pre-TPS)	Opioid-naïve patients undergoing primary total joint arthroplasty at a Veterans Affairs Medical Center.	N=208 comprising the TPS group (n=137) and a historical control group (n=71)	Preoperative, hospitalization, and postdischarge	Multidisciplinary TPS. During hospitalization, an individual pain management plan is initiated, which includes non-opioid oral pain medications, local and regional anesthesia, and optional individual sessions with a psychologist. An opioid taper plan is provided at discharge, which includes opioid taper support, opioid tracking to the patient, and tracking of PROMIS pain-related scores. Postoperative outpatient sessions with a psychologist are available and referral to chronic pain management is provided as needed.	Not specified but outcomes assessed at 90 days posthospital discharge	Primary outcome: Opioid cessation at 90 days. Pain outcomes: PROMIS scores for pain intensity (PROMIS 3 a) and pain interference (PROMIS 6b) collected preoperatively.	Primary outcome: Percentage of patients with persistent opioid use at 90 days post-discharge was significantly greater in historical control group (9.9%) than in TPS group (0.07%). In univariable and multivariable analyses, the mean number of tablets prescribed in the 90 day postdischarge period for the TPS group (n=49) was significantly lower than in the historical control group (n=119). Comparison between historical control and TPS groups not reported for pain and mental health outcomes.
Azam *et al*, 2024[18]	Secondary outcome study of a single-center, stratified RCT	Adults aged 18 years or older scheduled for surgical oncology procedures, including thoracic, gastrointestinal, gynecologic, urologic, head and neck, and breast cancer surgeries.	N=92 comprising a clinical hypnosis group (n=45) and a treatment as usual (TAU) group (n=47)	Participants were scheduled for surgical procedures, which determined their admission to the TPS, including pre-surgery assessments and the 2 clinical hypnosis sessions (the 1st 1–2 weeks before surgery and the 2nd 1–3 days after surgery).	Clinical Hypnosis. Scripts were ACT-informed and made use of ACT principles (eg, acceptance of acute pain) as well as direct and indirect suggestions for a reduction in pain intensity. Presurgery Session: One in-person session (20–25 min) designed to reduce anxiety and prepare participants for surgery, focusing on relaxation and self-soothing strategies. Postsurgery session: One in-person session (15–20 min) aimed at increasing comfort and pain relief during the hospital stay.	One in-person session of clinical hypnosis about 1–2 weeks before surgery, and one in-person session of clinical hypnosis in-hospital 1–3 days after surgery.	Primary outcome: High frequency heart rate variability (HF-HRV) 1 month after surgery Secondary outcome: BPI-SF and 0–10 Numeric Rating Scale (NRS) to measure pain intensity and severity before, 1 week, and 1 month after surgery.	Primary outcome: One month after surgery, HF-HRV was significantly higher in the CH group than the TAU group. HF-HRV decreased significantly from baseline, before surgery to 1 month after surgery for the TAU but not the CH group. Pain outcome: Pain intensity increased significantly from before to 1 week after surgery and decreased from 1 week to 1 month after surgery for both groups. Medication outcome: not reported

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Table 1 Continued

Author/year	Design	Population	Sample size	Time of admission to TPS	Nature of TPS treatment	Duration of TPS treatment	Primary and/or pain outcome(s)	Main results
Holeman *et al*, 2022[26]	Retrospective, longitudinal cohort study	Patients with COU undergoing elective cardiothoracic surgery, otolaryngology, general surgery, neurosurgery, orthopedic surgery, plastic surgery, urology, or vascular surgery procedure.	n=341 (n=44 for patients completely tapered off opioids after surgery; n=297 for patients with partial/no taper) followed up to 60 days after surgery	Before surgery	Patients received preoperative education about strategies to help taper opioids after surgery while managing pain, which included use of nonopioid analgesics and nonpharmacologic pain coping mechanisms. Further, an individualized pain management and opioid tapering plan was followed during the hospitalization for surgery and throughout the postoperative period. After hospital discharge, telephone calls were made by the TPS at postdischarge days 2, 7,14, 30, and 60 to promote opioid tapering.	Preoperative, during hospitalization for surgery, postoperative. Patients followed for 60 days postsurgery, with tapering plans initiated during hospitalization and continued after discharge.	Primary outcomes: Patient reported outcomes of pain intensity (PROMIS 3a) and pain interference (PROMIS 6b) measured from baseline before surgery to 60 days after surgery.	Primary outcomes: Baseline pain intensity and pain interference scores were not significantly different between patients who achieved complete opioid tapering and those with partial/no tapering. Secondary outcomes: Completely tapered patients showed a significantly greater reduction in mean MME from baseline compared with the partial/no taper group at all times after hospital discharge (ie, at 7, 14, 30, and 60 days) Mental health outcomes: did not differ between patients who completely tapered vs those in the partial/no taper group.
Ladha *et al*, 2024[20]	Retrospective, longitudinal cohort study with matched controls	Patients 18 years and older who underwent major surgery and were discharged to a community setting in Ontario.	209 TPS patients were matched to 209 patients who underwent surgery at other academic centers.	To be included in the intervention cohort, individuals must have had their first baseline contact with the TPS program prior to or within 60 days after the surgery discharge, have had a minimum of 2 visits total, and they must have had a date of surgery in their TPS record that was within 2 weeks before or after their hospital admission date.	The TPS program applies a multidisciplinary patient-centered approach to provide pain management for patients at risk of CPSP, related disability, and excessive opioid use.	The specific duration is not provided. Participants must have had a minimum of 2 visits total. The follow-up period for outcomes was 1 year after discharge.	Primary outcome: Postoperative opioid use in MME (assessed using outpatient prescriptions) over the 12 months after surgery	Primary outcome: Over the 12 months after surgery, both groups showed a significant decrease in MME with the TPS group decreasing by 3.53 MME per month compared with a decline of 1.05 MME for the control group. The mean difference (2.48 MME) in the reduction of MME over the 12 months after surgery between the TPS group and the control group was significant.

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Table 1 Continued

Author/year	Design	Population	Sample size	Time of admission to TPS	Nature of TPS treatment	Duration of TPS treatment	Primary and/or pain outcome(s)	Main results
Liu *et al*, 2021[27]	Prospective, longitudinal cohort study	Individuals >18 years who were scheduled to undergo elective thoracic surgery (video-assisted thoracoscopy or lateral thoracotomy).	n=279	Patients recruited 2–3 weeks prior to surgery at the preoperative assessment clinic.	The TPS program applies a multidisciplinary patient-centered approach to provide pain management for patients at risk of CPSP, related disability, and excessive opioid use.	Completed questionnaires preoperatively and in-person acute postoperative (POD 1–7), and at 3, 6 months and 1 year after surgery.	Pain outcome: pain intensity trajectories evaluated up to 12 months after surgery History of chronic pain was recorded including the location, average pain intensity score at rest (0–10 Numeric Pain Scale), duration of pain, and pain medications; Pain Disability Index (PDI).	Pain outcome: Growth mixture modeling showed 3 distinct trajectories: 1. mild pain intensity across the 12 months period (n=185); 2. moderate acute pain intensity which decreased sharply by 3 months and remained low at 12 months (n=32); and 3. moderate pain intensity across all time points. Mental health outcomes: Baseline PCS scores were significantly higher in Trajectory 3 vs Trajectory 1 but not Trajectory 2. 12-month depression scores were significantly higher in Trajectory 2 vs Trajectory 3 but not Trajectory 1. Significant differences among pain intensity trajectories were not found at 12 months for anxiety or somatization scores.
Manoharan *et al*, 2023[13]	Retrospective, longitudinal mixed-methods cohort study	Postsurgical patients (a total of n=329 contacted) ≥18 years, having had at least 1 PPP visit at least 6 months prior to the scheduled interview were seen an average of 33 months after first visit to the Johns Hopkins Personalized Pain Program (PPP).	N=26 (of the 329 contacted) agreed to participate and were divided into 2 groups based on their self-reported experiences with the PPP: positive (n=19) or negative (n=7)	Patients seen preoperatively and postoperatively	The PPP provides coordinated multimodal pain management involving personalized pain education and expectation setting, multimodal analgesia treatment, opioid tapering, and psychiatric cotreatment in an outpatient setting during the perioperative period.	Patients had on average a median of 7.5 visits to the PPP but duration of treatment with the PPP was not specified. Based on other published studies PPP treatment duration may span from 4 months before surgery through postoperative follow-up visits up to 2 year after surgery	Pain outcomes: Pain severity and pain interference score from the Brief Pain Inventory (BPI)	Opioid use reduced significantly between first PPP and time of the interview but not between the last PPP visit and time of interview. Participants with a positive, but not a negative, PPP experience significantly reduced opioid use between the first and last PPP visit (178 MME vs 46.7 MME, respectively). Compared with patients with a negative PPP experience, those with a positive experience had significantly lower pain severity, pain interference, and pain catastrophizing scores at the last PPP visit, and higher SF-12 mental health functioning at the last PPP visit SF-12.

Continued

Table 1 Continued

Author/year	Design	Population	Sample size	Time of admission to TPS	Nature of TPS treatment	Duration of TPS treatment	Primary and/or pain outcome(s)	Main results
Rosenbloom *et al*, 2024[19]	RCT	Patients aged ≥18 years scheduled for a surgical oncology procedure	N=92 (n=45 randomized to receive clinical hypnosis, n=47 to receive TAU)	Patients were recruited from the preadmission surgery clinic and surgical oncology clinics approximately 1–3 weeks prior to surgery.	Clinical Hypnosis presurgery and postsurgery. Scripts were ACT-informed and made use of ACT principles (eg, acceptance of acute pain) as well as Eriksonian pain intensity reduction.	Presurgical hypnosis session done immediately after presurgical assessment: 20–25 min, occurring 1–2 weeks prior to surgery. Postsurgical hypnosis session done on postoperative day one or at the first available time prior to hospital discharge. Consisted of 15–20 min. Participants were also encouraged to listen to audio recordings of hypnosis daily after hospital discharge.	Primary outcome: Between group comparison of opioid consumption (MME) during the first week after surgery. Secondary outcomes: Pain intensity, pain interference, PCS, mental health	Primary outcome: 1. Opioid consumption in the clinical hypnosis group was significantly lower than the TAU group on the first (mean difference: −115.6 MME) and fourth (mean difference: −13.9 MME) days after surgery. 2. One-month pharmacy dispensed opioids did not differ significantly between the clinical hypnosis (43.75 MME) and the TAU (0.0 MME) groups. Secondary outcomes: Significant group differences were not found for pain intensity, pain interference, anxiety or depression scores. PCS scores increased significantly from the presurgical assessment to 1 week after surgery in the in the TAU group but not the clinical hypnosis group.
Shechter *et al*, 2020[28]	Prospective, longitudinal cohort study	Patients receiving clinical care at the Johns Hopkins PPP, including surgical patients, postsurgical patients, and patients not yet scheduled for surgery, referred to the PPP by their surgical team, primary care doctor, pain specialist, or other providers or were self-referred.	Of n=145 patients recruited 61 met inclusion criteria	Patients admitted across the continuum of the perioperative period, as well as postsurgically and patients not yet scheduled for surgery.	A multidisciplinary team, including a pain specialist and, when needed, a psychiatrist, provides individualized care tailored to each patient. Patients and families are educated on non-opioid pain management and the risks of increased opioid use postsurgery. Treatment includes goal-setting, a multimodal analgesic regimen, opioid tapering, and, if necessary, psychiatric care and physical therapy. Monitoring extends up to 6 months postoperatively, with regular updates to the referring medical team, and patients are transitioned to their primary care provider when stable.	Throughout perioperative period, starting 4 weeks before or immediately after surgery. Patients were followed for up to 6 months postoperatively, with treatment adjustments and monitoring throughout the perioperative period.	Opioid outcome: Reduction in MME/week. Pain outcomes: Pain severity and interference (BPI); Pain severity and presence (Short-Form McGill Pain Questionnaire [SF-MPQ] Visual Analogue Scale (VAS), Present Pain Intensity (PPI)). Mental/Physical Health Outcome: 12-item Short Form Health Survey (SF-12)	Significant reduction (−4.98 MME per week) in opioid use over time. Significant improvement in SF-MPQ VAS, PPI, and sensory scores and BPI pain interference scores over time. Significant improvement in SF-12 physical and mental functioning scores over time.

Continued

Table 1 Continued

Author/year	Design	Population	Sample size	Time of admission to TPS	Nature of TPS treatment	Duration of TPS treatment	Primary and/or pain outcome(s)	Main results
Slepian *et al*, 2020[5]	Part of a larger prospective cohort study to evaluate user engagement with Manage My Pain (MMP) app	Patients referred to the TPS for management of postsurgical pain and complex chronic pain.	Of the 196 patients who consented to the larger study, 132 also provided consent to the MMP app component, and 119 completed registration.	1. Prior to surgery if patients have risk factors for postsurgical pain and opioid use. 2. In-hospital after surgery via the acute pain service. 3. After hospital discharge by surgeons or primary care physicians for persistent postsurgical or complex chronic pain. Participants were recruited into the study at the first encounter with TPS staff.	Manage My Pain mobile health application involving a self-report pain record assessing pain intensity; a daily reflection record gathering information about the meaningful activities patients engage in on a given day; and this information can then be shared with the clinical and research team, which are shared with medical providers prior to visits.	Use of the MMP application was tracked for 90 days after registration.	Pain outcome: Pain record completed using the MMP app which includes pain intensity using 0–10 NRS, along with the option to answer 8 additional questions about pain characteristics. User engagement outcome: Uptake of MMP app and user retention statistics	The median number of pain records completed was 7 and the median number of daily reflections was 2. User engagement: 68% of participants became active MMP users Median duration of app activity 56.5 days became active users reflected by having completed at least one record.
Xiao *et al*, 2023[29]	Prospective, longitudinal cohort study	Patients ≥18 years undergoing nonemergent open cardiac surgery via median sternotomy (coronary artery bypass grafting surgery, valve replacement or repair, aneurysm repair, heart transplant, or insertion of a ventricular assist device).	n=1059	Not mentioned	The TPS program applies a multidisciplinary patient-centered approach to provide pain management for patients at risk of CPSP, related disability, and excessive opioid use. Participants received routine institutional analgesic protocols administered and supervised by the acute pain service. Preoperative assessments included demographic factors, baseline pain intensity, and psychological distress measures.	Patients were assessed 5 days preoperatively, and 3, 6, and 12 months preoperatively.	Primary outcome: Presence of non-zero chest pain >3 months after surgery. Preoperatively: Baseline pain intensity assessed using 0–10 NRS. Leeds Assessment of Neuropathic Signs and Symptoms Pain Questionnaire (S-LANSS) was used to investigate whether chronic pain was compatible with a neuropathic pain phenotype. Medication outcome: MME	Pain outcomes: 29%, 19%, 15% of patients reported non-zero postsurgical chest pain at 3, 6, and 12 months after surgery, respectively. Mean NRS pain severity across the first 5 postoperative days was 3.8 with 63% reporting pain scores in the moderate-to-severe range. The incidence of possible neuropathic pain as measured by the S-LANSS increased over time from 34% at 3 months to 64% at 12 months. Medication Outcome: Mean opioid consumption during the first 5 days after surgery was 240 MME. Multivariable adjusted analysis showed that female sex, pre-existing chronic pain, previous cardiac surgery, preoperative depression, baseline pain catastrophizing scores, and moderate-to-severe acute pain were significant predictors of postsurgical pain at 3 months.

month decreased by 3.32 MME for the TPS group vs 0.51 MME for the matched controls.

RCTs to enhance TPS treatment

Two articles presented data from a single RCT using the same cohort of patients.[18 19] One evaluated the effects of clinical hypnosis versus treatment as usual (TAU) on (1) in-hospital opioid consumption in the first week after surgery (primary outcome) and the second, on (2) high-frequency heart rate variability (HF-HRV) and pain 1 month after surgery (secondary outcomes). Since all participants were treated by a TPS the study essentially evaluates the effects of TPS care plus clinical hypnosis versus TPS care alone. 92 participants awaiting oncological surgery were randomized to receive TAU or clinical hypnosis after completion of questionnaires and ECG and respiration recording for HF-HRV analysis. HF-HRV is clinical biomarker of vagal heart rate modulation that is inversely associated with acute pain. Higher levels of HF-HRV are viewed as advantageous and correlate with greater adaptability, lower stress, and greater vagal tone. Participants assigned to the clinical hypnosis group received one in-person session of clinical hypnosis 1–2 weeks prior to surgery and a second session in-hospital 1–3 days after surgery. Intention-to-treat analyses showed an opioid-sparing effect of clinical hypnosis during the acute postoperative period showing significantly less opioid (MME) consumed by clinical hypnosis participants than TAU participants on the first and fourth days after surgery. Hypnosis also protected participants against the negative effects of increases in catastrophic thinking about pain that the TAU participants exhibited 1 week after surgery.[19] One month after surgery, HF-HRV was significantly higher in the clinical hypnosis group than the TAU group and in the latter, but not the former, group HF-HRV decreased significantly from before surgery to 1 month after surgery.[18] Taken together, these findings indicate that among patients undergoing oncological surgery, provision of perioperative clinical hypnosis over-and-above TPS treatment reduces in-hospital opioid consumption and suggests that hypnosis may mitigate the adverse effects surgery has on autonomic function, thereby contributing to improving postsurgical recovery.

Summary of TPS efficacy studies

The four outcome studies that compared TPS patients to a non-TPS control group were conducted by two research groups from institutions that have similar TPSs though they are in different countries. Both admit patients into the TPS based on preoperative CPSP risk factor assessment, provide preoperative education, and offer similar medical and psychological treatment, including ACT. Taken together, the results of these four studies suggest that TPS treatment is associated with better opioid use outcomes, including fewer opioid tablets prescribed at discharge, better opioid weaning results, a lower incidence of new-onset chronic opioid use, and lower consumption of opioids even at later time points up to 1 year after surgery but the magnitude of some of these differences[20] raises the question of clinical significance. All four studies have methodological problems; some have been acknowledged by the authors but others have not. Apart from the potential for selection bias and confounding associated with non-randomized studies, use of historical controls raises a host of other possible biases that may influence the results. The decision to use a measure of QoL on day 3 after surgery as the primary outcome is questionable as is the choice not to perform statistical analysis on secondary outcomes.[30] Although Patient Reported Outcome Measurement Information System pain measures and mental health outcomes were assessed in TPS patients in two of the studies, these data were not available in the historical control groups.[21 22] The absence of these results raises the question of whether or not the significant differences in opioid use were achieved at the expense of higher levels of pain severity, pain interference, and poorer mental health outcomes (see Katz *et al*).[31] While these preliminary studies are generally positive, large-scale, RCTs are needed to provide a more definitive picture of whether TPSs are effective in reducing opioid consumption and improving pain and mental health outcomes in the short and long term.

NOVEL RISK FACTORS FOR CPSP

Over the years, we and others have identified many risk and protective factors for CPSP,[32–42] although the strength with which they predict CPSP varies considerably, and few have been shown to be causal[34 43 44] It is likely that some risk factors are universal to all surgeries and others are surgery specific. Type of surgery is one of the most consistent risk factors identified with surgeries that involve unavoidable or inadvertent nerve damage producing the highest rates of CPSP,[32 34] although not all CPSP is neuropathic in nature.[45] A recent comprehensive umbrella review identified 39 presurgical risk factors classified into six categories, comprising (1) psychological, (2) pain-related, (3) health-related, (4) social/lifestyle-related, (5) demographic, and (6) genetic factors.[46] A consistently high level of evidence was found for preoperative pain (eg, presence, intensity), depressive symptoms, anxiety symptoms, and catastrophic thinking about pain. To this, we would add age (younger or older depending on the surgery),[46] female sex,[46] and preoperative opioid use.[25 31 47] Risk factors for higher opioid consumption up to 1 year after surgery include male sex, preoperative substance use disorder, and higher levels of pain-related interference.[48]

Two recent prospective, longitudinal studies conducted by the TGH-TPS have identified novel or rarely studied psychological risk factors for CPSP; namely, preoperative distress over bodily sensations (formerly known as somatization)[49] and an overgeneral autobiographical memory retrieval style.[50]

Distress over bodily sensations

In the first study, 543 adults undergoing cardiac or thoracic surgery were assessed at baseline before surgery and followed up to 6 months after surgery.[49] Before surgery, participants completed questionnaires measuring demographic, clinical, and psychological factors (distress about bodily sensations, catastrophic thinking about pain, anxiety sensitivity, symptoms of anxiety and depression) and were followed up 6 months later when they recorded current pain intensity (0–10 NRS) and completed a measure of pain disability using the Pain Disability Index. Multinomial logistic regression was used to determine the extent to which presurgical measures of distress over bodily sensation, and catastrophic thinking about pain separately predicted pain intensity and pain disability 6 months after surgery after controlling for important confounders. Age and presurgical scores on the Symptom Checklist-90 (SCL-90) Revised Somatization subscale significantly predicted CPSP intensity whereas presurgical SCL-90- Revised Somatization scores were the sole predictor of CPSP pain disability. Taken together, these results show that greater presurgical distress over bodily sensations predicts greater chronic pain intensity and disability 6 months after cardiothoracic surgery and raise the possibility that intervening preoperatively to reduce presurgical distress about bodily

sensations may prevent or obtund the development of CPSP intensity and disability.

Autobiographical memory and CPSP

Interest in the role of memory processes in general, and autobiographical memory, in particular, in initiating and maintaining chronic pain has gained traction in recent years.[50–52] Autobiographical memory describes a memory system involving personal episodic and semantic details of a person's past. Autobiographical episodic memories can vary in degree of specificity. Specific episodic memories include personal information tied to time and place (eg, "Last Thursday morning just before breakfast, I slipped on the kitchen floor and twisted my left ankle.") whereas overgeneral memories lack such specificity (eg, "I'm always twisting my ankle."). Previous research has shown that people with chronic pain tend to recall memories with reduced specificity to time and place[51] leading us to predict that an overgeneral memory style might be a risk factor for CPSP and conversely, that autobiographical memory specificity might be a protective factor.[50]

To test this hypothesis, we conducted a prospective, longitudinal observational study of 97 adult participants scheduled for major surgery.[50] Before and 1 month after surgery, participants' memories were assessed with the Autobiographical Memory Test in which they were asked to recall personal events in response to five positive and five pain-related word cues. The presence or absence of pain and measures of psychological functioning were assessed before and 1, 3, 6, and 12 months after surgery. Generalized estimating equations were used to model pain at each time point after surgery using memory variables as predictors. The results showed that, as hypothesized, the greater the number of preoperative-specific pain memories recalled, the lower the odds of pain across all time points. As well, the longer the time taken to recall the memories and the more surgery-related content in the memories at the 1 month assessment were associated with greater odds of reporting postsurgical pain up to 12 months after surgery. These results show that an overgeneral presurgical autobiographical memory retrieval style is a risk factor for postsurgical pain up to 1 year after surgery. At the present time, it is unclear whether this memory bias is a causal risk factor for CPSP, but to the extent that it is, perioperative interventions aimed at improving the specificity and modifying the content participants' memories may be effective in preventing or reducing the incidence of CPSP.

FUTURE DIRECTIONS IN TGH-TPS INTERVENTIONS

Psychology is a critical pillar of the multidisciplinary care offered at most TPS's. But access to TPS care is, at present, limited to in-person, specialized hospital-based clinics. Such clinics, by necessity, prioritize patients at highest risk for CPSP to the exclusion of others equally in need of care. They often require physician referrals for access and have unacceptably long wait times. Moreover, one of the major challenges in providing quality care after surgery is the shortage of specialized pain psychologists, which further limits access to the relatively few pain treatment facilities that employ psychologists. To address this gap in service provision, the TGH-TPS is evaluating the feasibility of a self-guided, online ACT intervention, specifically for postsurgical patients titled Advancing Online Psychology Tools for the TPS (ADOPT-TPS) developed for use on the Manage My Pain mobile app. A two-arm, randomized, controlled pilot feasibility trial will compare the efficacy of ADOPT-TPS with a preexisting psychologist-guided workshop.[53] Accessible online pain interventions of this sort will allow for the dissemination of pain psychology tools directly to the people who are in need as well as to services and clinics that currently do not have a psychologist on staff.

Another area of future research at the TGH-TPS involves evidence of associations among chronic pain, alterations in autobiographical memory, and structural and functional changes in the hippocampus.[51 52] Our data, briefly reviewed above, showed that the number of time-and-place-specific (vs overgeneral) pain memories generated in response to pain-related cues prior to surgery was associated with significantly lower odds of CPSP suggesting that the ability to retrieve specific memories of pain events protects against CPSP.[50] Autobiographical memory specificity can be enhanced using Memory Specificity Training (MeST)—a brief, targeted cognitive intervention that teaches patients strategies to enhance specificity of retrieved autobiographical memories. MeST is effective in enhancing specificity of retrieved memories in other clinical populations with an overgeneral memory bias[54] but it has yet to be evaluated in patients undergoing surgery who are at high risk of developing CPSP. The TGH-TPS is currently conducting a blinded, randomized, two-arm, controlled internal pilot trial of 44 adults undergoing thoracic surgery comparing MeST to an attention control condition. Structural and functional neuroimaging, memory specificity assessment, and self-report measures are completed before surgery and 3 months later. Results will determine whether we proceed with a full-scale RCT.

From a clinical care standpoint, the TGH TPS has recently recruited a psychiatrist specialized in managing pain and substance abuse. It has become clear that chronic pain and substance use are both highly prevalent, frequently comorbid, and of considerable public health concern.[55 56] Pain-substance use models indicate that these two conditions operate in a positive feedback loop.[57–60] Harm reduction in the field of pain has become a highly relevant topic given the increase in intravenous drug use in North America and for patients struggling with other active substance use disorders (ie, alcohol, cannabis, methamphetamine) who present for surgery.[61] Improving care for patients with substance use disorders as well as for other marginalized populations will be an area of TGH TPS program expansion in the coming years.

COMMON BARRIERS TO IMPLEMENTATION OF A TPS

While there has been implementation and growth of TPSs internationally, the adoption and expansion of these services has not been without challenges. Almost every institution that performs major surgery should have a service that helps those struggling with postoperative pain disability and increased opioid consumption out of keeping with a normal trajectory. The economic impact of TPS is a hot topic of discussion in the USA.[15] Some argue that if a TPS reduces emergency room visits, the cost to society is reduced but the cost to a hospital system may actually be increased (as a hospital would otherwise be able to bill for these visits).[9] What is likely true, regardless of the healthcare system or geographical location in which a TPS is built, is that increased funding for administrative assistants, and non-fee for service providers (ie, psychologists, physiotherapists, acupuncturists) likely requires new and ongoing base funding. The ability to advocate successfully for additional financial resources continues to be the major barrier to entry for many Departments of Anesthesiology and Pain Medicine interested in pursuing these endeavors.

CONCLUSIONS

Over the past 10 years, TPSs have developed to assess and manage patients at high risk of CPSP. Patients are identified as early as possible and are provided comprehensive care by a multidisciplinary team. Preliminary results suggest that TPS treatment is associated with better opioid use outcomes, including fewer opioid tablets prescribed at discharge, better opioid weaning results, a lower incidence of new-onset chronic opioid use, and lower consumption of opioids even at later time points up to 1 year after surgery. The TGH-TPS is conducting a multisite RCT titled Reducing Opioid Use for Chronic Pain Patients Following Surgery (RECOUP). The RECOUP trial's inclusion criteria consist of adults aged 18 years and older who are undergoing any type of surgical procedure and taking 10–400 mg of preoperative oral MMEs preoperatively for at least 1 month prior to surgery. In addition to the primary outcomes of pain disability and opioid weaning, the four core chronic pain outcome domains recommended by the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials[62]—pain intensity, physical functioning, emotional functioning and participant rating of overall improvement are key secondary outcomes as well. The above trial and others (eg, a German multisite trial) are ongoing, and the expansion of TPSs across the US and abroad continues. The building of future TPSs will continue to close a critical gap in perioperative care at many institutions worldwide. TPSs are likely to continue to evolve and strengthen the role of multidisciplinary care teams in the immediate postdischarge period, a critical time when patients can benefit from education and care regarding pain and postoperative opioid consumption.

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