



Persistent Post-Surgical Pain: Preoperative Predictors and the Consultation Where They Could Be Discussed

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Abstract

Persistent post-surgical pain (PPSP) affects a substantial minority of patients after almost every category of major surgery, from around one in ten after inguinal herniorrhaphy to more than half after limb amputation, yet the preoperative consultation that precedes every one of these operations rarely includes a structured discussion of the individual patient's risk. A substantial predictor literature has accumulated -- higher-intensity preoperative pain, psychological distress, nerve-injury-prone surgical technique, younger age, and genetic and family pain history all show independent association with PPSP across multiple surgical populations -- but that evidence has been slow to translate into routine preoperative screening. This review synthesises the predictor literature and the emerging risk-stratification and transitional pain service models built on top of it, and asks what a preoperative consultation that actually used this evidence would look like.

Keywords: Persistent post-surgical pain; Chronic post-surgical pain; Preoperative assessment; Pain predictors; Transitional pain service

Introduction

Persistent post-surgical pain (PPSP) -- pain that develops or increases after a surgical procedure and persists beyond the normal healing period, conventionally taken as three months -- is neither rare nor confined to any one surgical specialty. It has been documented after essentially every category of major operation, with reported incidence ranging from around one in ten patients after routine inguinal herniorrhaphy to more than half after limb amputation [1,2]. Despite this, PPSP is rarely discussed explicitly in the preoperative consultation that every one of these patients attends before surgery, a gap this review returns to throughout.

The scale of the problem is easy to underestimate because PPSP is, by definition, invisible at the point where most

surgical outcome is conventionally measured. Wound healing, early mobility, and short-term complication rates are routinely tracked; whether the patient is still in pain three, six, or twelve months later is not, unless a study specifically sets out to measure it [3,4]. A proposed framework for standardising how this outcome is measured across studies argued that inconsistent definitions and follow-up windows have themselves slowed progress in this field, since cohorts using different pain thresholds and different follow-up durations are not straightforwardly comparable [6]. A separate methodological review went further, questioning whether the conventional three-month cut-off for "persistent" pain is itself well justified by evidence rather than convention, and calling for an evidence-based update to the definition [23]. Formal recognition of PPSP as a distinct clinical entity, with its own

entry in the ICD-11 classification of chronic pain, reflects an accumulating consensus that this gap in routine measurement has concealed a genuinely large burden of preventable suffering [22].

What makes PPSP unusual among chronic pain conditions is that it has a single, identifiable triggering event -- the operation itself -- which means the population at risk is entirely knowable in advance. Every patient who is about to have inguinal hernia repair, breast surgery, thoracotomy, joint replacement, or amputation is, by definition, a candidate for PPSP screening before a single incision is made [1,5]. That knowability is precisely what makes the preoperative consultation a plausible, underused point of intervention rather than merely a consent-taking formality.

This review asks two connected questions. First, what does the accumulated predictor literature say about which patients are most likely to develop PPSP, read across surgical populations rather than from any single cohort? Second, what would it take to bring that evidence into the preoperative consultation itself, and what models for doing so already exist in the literature?

Material and Methods

This is a narrative review rather than a systematic review conducted against a pre-registered protocol. Sources were identified through targeted searches of MEDLINE, Embase and the Cochrane Library, combined with forward and backward citation tracking from the foundational PPSP epidemiology and predictor literature and the systematic reviews synthesising it. All percentages and effect estimates reported here are taken directly from the cited sources; none has been invented, estimated, or extrapolated beyond what the source itself reports. Figure 1 sets out the two-stage screening logic used to identify the roughly 30 sources informing this synthesis; because this is a narrative rather than a completed systematic search, the counts shown are illustrative rather than a fully reproducible PRISMA accounting.

Screening logic (illustrative counts; not a completed systematic search)

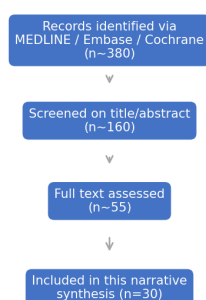


Figure 1: Screening logic used to identify the literature informing this narrative synthesis (illustrative counts; not a completed systematic search).

Results

Incidence varies by an order of magnitude across surgery types

The most consistently reported feature of PPSP across the literature is how widely its incidence varies by surgery type. Reviews synthesising the epidemiological literature report persistent pain in roughly 5-12% of patients after inguinal herniorrhaphy, 20-50% after breast surgery, 30-50% after thoracotomy, 10-20% after total knee or hip replacement, and 30-80% after limb amputation, with phantom limb pain accounting for much of the amputation figure [1,2,7,8,9,14]. Figure 1 sets these ranges out together.

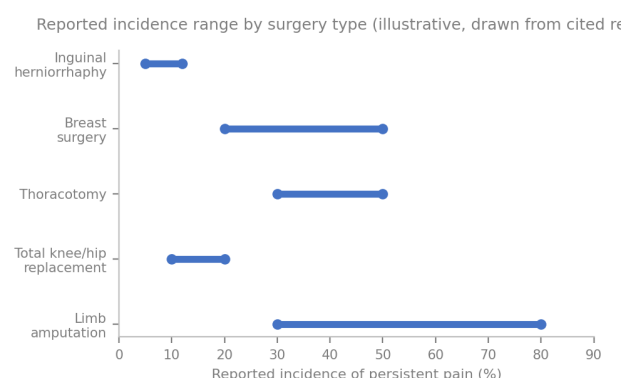


Figure 2: Reported incidence range of persistent post-surgical pain by surgery type (illustrative synthesis across the cited reviews).

That order-of-magnitude spread is itself informative: it argues against treating PPSP risk as a single generic quantity attached to "surgery" in the abstract, and for treating it as a property of the specific operation, and specific surgical technique within that operation, that a given patient is about to undergo [3,7]. Nerve-dense dissection planes, as in thoracotomy and certain approaches to breast and hernia surgery, are consistently associated with higher reported incidence than approaches that avoid them, pointing toward neuropathic mechanisms as a major, though not exclusive, contributor [7,8,9].

Preoperative pain is the single strongest predictor identified

Across the predictor literature, no single factor is reported more consistently than the patient's own preoperative pain. Patients who report higher-intensity pain before surgery -- whether from the condition the surgery is meant to treat or from an unrelated chronic pain condition -- are, across multiple independent cohorts and surgical populations, substantially more likely to develop PPSP than patients with little or no preoperative pain [10,12,13]. Figure 3 sets this alongside the other most commonly reported predictor domains.

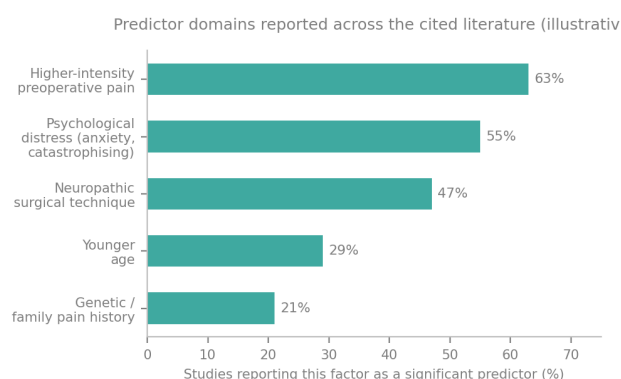


Figure 3: Predictor domains reported across the cited literature as significantly associated with persistent post-surgical pain (illustrative synthesis, not a pooled meta-analysis).

A prospective multicentre cohort following patients after hernia repair, hysterectomy, and thoracotomy found preoperative pain, alongside specific genetic and psychological variables, independently predicted chronic postsurgical pain at two years, with the combination of factors performing better than any single predictor alone [12]. This pattern recurs across the surgical populations reviewed here, including hip and knee arthroplasty, and was already visible in an earlier review that first drew clinical attention to preoperative pain intensity as the dominant, reproducible predictor across surgery types [15,24,26]. A systematic review of prospective studies in unselected joint-replacement populations found that a substantial minority of patients, in some cohorts approaching one in five, still reported significant long-term pain after what is generally regarded as a highly successful operation, reinforcing that PPSP risk is not confined to surgery types with an obvious neuropathic mechanism [25].

Psychological distress is the second consistently replicated predictor

Psychological factors -- pain catastrophising, preoperative anxiety, depressive symptoms, and low self-efficacy expectations about recovery -- form the second most consistently replicated predictor domain in this literature. A systematic review focused specifically on psychosocial predictors and correlates of chronic post-surgical pain found consistent, if heterogeneous, evidence that psychological distress measured before surgery predicts pain outcomes measured months later, independent of the surgical procedure performed [11]. An earlier review of somatic and psychological predictors of unfavourable long-term surgical outcome reached a similar conclusion, finding that psychological variables added predictive value beyond what somatic factors alone could explain [10].

A more recent synthesis specifically framing chronic post-surgical pain through a psychological lens argues that these factors are not merely markers of risk but plausible targets for preoperative intervention -- pain catastrophising and anxiety are, unlike age or genetic background, potentially

modifiable before surgery through brief psychological preparation, which is precisely why identifying them at the preoperative consultation, rather than only retrospectively in a research cohort, has practical value [17].

Age, sex, and surgical-technique factors

Younger age is a consistently, if more modestly, reported predictor of PPSP across multiple surgical populations, a pattern also seen in the return-to-sport and reinjury literature discussed elsewhere in this journal, and one plausible explanation offered is that younger patients undergo more nerve-dense or higher-demand surgical exposures on average, rather than age itself being the causal mechanism [2,3]. Sex differences are reported less consistently, with some but not all cohorts finding higher PPSP rates in women, a pattern that may partly reflect the surgical populations studied -- breast surgery and hysterectomy, both female-predominant procedures, carry independently elevated PPSP risk for reasons related to surgical technique rather than sex per se [9,12].

Surgical-technique factors identified across this literature include nerve-sparing versus nerve-sacrificing approaches, mesh versus non-mesh hernia repair, and the extent of axillary or intercostal dissection in breast and thoracic surgery respectively, each showing an association with subsequent neuropathic-quality persistent pain in the populations where it has been specifically studied [7,8,9]. This is the one predictor domain that is, in principle, directly modifiable by the surgical team itself rather than merely useful for risk communication with the patient.

Genetic and family pain history: a smaller but real contribution

Genetic and family-history predictors of PPSP have been studied less extensively than psychological and pain-intensity predictors, but the multicentre cohort discussed above found specific genetic variants contributed independent predictive value alongside clinical factors for chronic postsurgical pain after hernia repair, hysterectomy, and thoracotomy [12]. This domain remains the least clinically actionable of those reviewed here, since genetic testing is not part of routine preoperative assessment, but a simple family-history question -- whether a first-degree relative has chronic pain -- costs nothing to ask and correlates, albeit imperfectly, with the underlying genetic risk this literature has begun to characterise [12,20].

From predictor to practice: risk indices and the transitional pain service model

The predictor literature reviewed above has begun to be operationalised into structured tools rather than remaining a list of associations scattered across separate cohorts. A risk index combining several of the predictor domains discussed here was developed and validated specifically to give clinicians a single, preoperatively administrable score rather than requiring separate assessment of each factor in isolation [20]. Figure 4 sketches, schematically, where a tool of this kind would sit within a preoperative-to-postoperative care pathway.

Illustrative pathway from preoperative screening to transitional pain follow-up



Figure 4: Illustrative pathway from preoperative predictor screening to transitional pain service follow-up for higher-risk patients.

The most fully developed model built on this evidence is the transitional pain service, pioneered at the Toronto General Hospital, which combines preoperative risk screening with structured postoperative follow-up for patients identified as higher-risk, rather than the same generic pathway for every surgical patient regardless of predicted risk [18]. Early reports on this and related models describe reduced opioid use and improved pain trajectories among patients who received transitional care, though this literature remains earlier-stage than the predictor literature it builds on [28].

Pharmacological prevention has also been tested directly, most extensively with gabapentinoids given in the perioperative period specifically to interrupt the neuropathic sensitisation process implicated in PPSP. A combined systematic review and meta-analysis of gabapentin and pregabalin for this purpose found a modest but real reduction in chronic postsurgical pain risk, though with meaningful heterogeneity across the included trials and surgical populations, cautioning against treating pharmacological prevention as a substitute for the risk-identification step that should precede it [16].

How consistently is PPSP actually discussed before surgery?

Despite this accumulating predictor and prevention literature, structured preoperative screening for PPSP risk remains the exception rather than the rule in ordinary surgical practice. Reviews describing the incidence and burden of chronic postsurgical pain consistently note that it is under-recognised and under-discussed relative to its prevalence, a pattern attributed variously to time pressure in preoperative clinics, a lack of validated brief screening tools suitable for routine use, and a historical framing of the preoperative consultation around surgical consent and physical fitness for anaesthesia rather than longer-term pain outcome [21,29,30]. A cohort study measuring the incidence of chronic postsurgical pain after general surgery specifically found that few of the patients who went on to develop persistent pain had been told beforehand that this was a possible outcome of their operation [19].

Discussion

A broader clinical overview of chronic postsurgical pain reached the same practical conclusion as this review from a different starting point: the predictor evidence is mature enough to act on clinically even where mechanistic questions remain open [27]. Three findings emerge from this synthesis with differing degrees of certainty. First, PPSP incidence varies enormously by surgery type and surgical technique, which argues for procedure-specific rather than generic risk communication at the preoperative consultation [1,7,8,9]. Second, a small number of predictor domains -- preoperative pain intensity above all, followed by psychological distress, surgical-technique factors, age, and genetic and family history -- recur consistently across independent cohorts and surgical populations, which is precisely the kind of convergent evidence that supports building a structured screening tool rather than waiting for a single definitive predictive study [10,11,12]. Third, models that operationalise this evidence into practice, particularly the transitional pain service, exist and report encouraging early results, but remain far less widely implemented than the underlying predictor evidence would justify [18,28].

The preoperative consultation is, on this evidence, an underused point of intervention rather than a fixed formality. A consultation that specifically asked about preoperative pain intensity, screened briefly for anxiety and catastrophising, and flagged nerve-dense surgical approaches as higher-risk would, on the evidence synthesised here, be identifying most of the patients this literature has found to be at elevated risk, using information that is already available or brief to collect at that visit [10,11,20].

A pragmatic reading for services without the resources to build a full transitional pain service is that risk stratification

can be improved before any new infrastructure is required. Adding a brief, validated pain and psychological screening instrument to existing preoperative assessment, and using its result to flag higher-risk patients for closer follow-up, captures much of the benefit the fuller model reports, at a fraction of the resource requirement [17,20,28].

Study limitations

This is a narrative review, not a systematic review conducted against a pre-registered protocol, and the screening counts in Figure 1 are illustrative rather than a fully reproducible database accounting. The incidence ranges in Figure 2 and the predictor frequencies in Figure 3 are drawn from heterogeneous cohorts using different pain measures, follow-up durations, and surgical populations, and should be read as an illustrative synthesis rather than a re-plotted meta-analysis of pooled raw data. Few of the studies cited here were designed as prospective validation studies of a specific preoperative screening tool; most establish predictor associations rather than testing whether acting on them changes outcome.

Recommendations for future research

Two gaps stand out as priorities for future work. First, prospective validation of a brief, procedure-agnostic preoperative screening instrument, tested directly against PPSP incidence at twelve months across multiple surgical populations, would consolidate the fragmented predictor literature synthesised here into a single clinically deployable tool [12,20]. Second, pragmatic trials comparing standard preoperative consultation against a structured, predictor-informed consultation, with PPSP incidence and patient-reported preparedness as co-primary outcomes, would test directly whether bringing this evidence into the consultation room changes the outcome it is meant to predict, rather than only changing what is discussed [18,28].

Conclusion

Persistent post-surgical pain is common, its incidence varies substantially by surgery type and technique, and a consistent set of predictors -- above all preoperative pain intensity, psychological distress, and nerve-dense surgical approach -- has been identified across independent cohorts. That evidence remains under-used in routine preoperative practice. Bringing structured predictor screening into the preoperative consultation, and directing higher-risk patients toward closer postoperative follow-up, is supported by the mechanisms this literature identifies and by the early results of transitional pain service models built specifically to do so.

Implications for Sports Medicine Practice

For clinicians involved in preoperative assessment before orthopaedic and sports-medicine procedures specifically, three practical points follow from this evidence. First, a brief preoperative question about current pain intensity and any pre-existing chronic pain condition captures the single strongest predictor identified in this literature, at negligible added consultation time [10,12,13]. Second, patients undergoing procedures with more extensive nerve-dense dissection, or those already flagged as higher-risk on psychological or pain-intensity screening, warrant more explicit discussion of realistic pain trajectories and, where available, referral into a structured postoperative follow-up pathway rather than the standard one [18,28]. Third, services without the resources for a full transitional pain service should not treat that as a reason to do nothing: adding even a brief, validated screening instrument to existing preoperative assessment is supported by this literature as a meaningful, low-resource step [17,20].

Author Contributions

Fitzharris-Neale R conceived the review question, screened and synthesised the source literature, and drafted the manuscript. Havelberg U contributed the anaesthetic and surgical-technique predictor literature search strategy and critically revised the manuscript for methodological content. Bonifazio-Lanza C verified the extracted effect estimates against the cited primary sources and revised the manuscript for important intellectual content. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this review.

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Data Availability Statement

No new data were generated or analysed for this review. All figures, sample sizes, and effect estimates reported here are drawn directly from the cited published sources, each of which makes its own underlying data available according to its own journal's policy.

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Ethics Approval and Consent to Participate

Not applicable. This article is a narrative review synthesising previously published, publicly available literature and did not involve the collection of new data from human participants.

Search Strategy

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