

Chronic pain after surgery: Let's talk about the elephant(s) in the room

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Introduction

In the United Kingdom, one in 10 people undergo a surgical procedure each year.¹ The management of pain after such surgery is often inadequate and poor. Acute post-operative pain, if poorly managed, is associated with decreased quality of life, delayed recovery time, prolonged hospital admission and opioid use, and higher health care costs in general.² The intensity of acute pain after surgery is predictive of a higher incidence of chronic pain.

Chronic pain causes a significant burden to society in terms of its effect on productivity (£32 billion annually) and low patient satisfaction and mood leading to mental health problems.³ It is reported that chronic pain affects almost one-third to one-half of the UK population (28 million)⁴ and most common surgeries like hip/knee replacements can leave up to 20%–25% of patients with chronic pain. In the United Kingdom, 4.7 million surgical procedures were performed in 2013/2014,⁵ and this therefore means that up to 800,000 patients every year will be left with chronic pain, causing a loss of billions in lost productivity.

At the same time, better recognition and diagnosis of mental health disorders such as anxiety and depression and the reduction in associated stigma may account for an increased prevalence, especially in the younger age groups. It is estimated that one in six adults will have a mental health disorder.⁶ Patients with prior mental health problems such as anxiety and depression are more likely to catastrophise and so, when presenting for any surgical procedure, are at a higher risk of having severe pain and chronic pain after surgery.

In our role as anaesthetists and perioperative physicians, we have an important task in optimising the patient's journey through surgery. We try to optimise cardiorespiratory fitness and a variety of other parameters to lower the risk of anaesthesia and provide safe and effective analgesia during the patient's perioperative stay. The 2014 Royal College of Anaesthetists (RCoA) document⁷ stresses the importance of anticipating long-term medical harm such as heart failure or deteriorating kidney function, but there is one thing missing: *there is no mention of chronic pain. Considering the scale of the problem, it is difficult to understand why this was not given equal importance in the Vision document.* There is an urgent need to have a better plan in place for recognising, assessing and managing chronic pain as this has an implication for how patients are looked after in the immediate perioperative period. Potentially, managing acute post-operative pain effectively could reduce the chance of post-surgical chronic pain.

It leads us to ask more fundamental questions of our present understanding of the root causes of chronic pain. We assume that surgery is the obvious necessity and then postulate preoperative, intraoperative and post-operative risk factors for chronicity and try to address them. But have we asked ourselves the question whether we are taking people on the wrong surgical journey?

After all, literature exists to show that imaging on asymptomatic shoulders, hips, knees and spine all show significant abnormalities.^{8–11} Are we falling victim to the phenomenon of '*post hoc, ergo propter hoc*' (Latin: 'after this, therefore because of this')? Could this be a reason for us operating on more people than necessary? What if the reason for failure of pain relief after surgery is because the abnormal-looking joint was never the reason for the experience of pain? Could we be sometimes medicalising normal or near-normal life experiences? I know these are a lot of questions but these are questions that do need to be asked if we are looking at root causes of chronic post-surgical pain.

With the advances in perioperative care, we are collaborating more frequently with our surgical colleagues to optimise patients better. In the spirit of the 'Getting It Right First Time' (GIRFT), it is indeed the right moment to use the same principles to influence the trajectory of chronic post-surgical pain.

Certainly, the establishment of the Centre for Perioperative Care (CPOC) in May 2019 is a step in the right direction by the RCOA in this regard.¹² The RCOA vision document¹³ highlights that we should offer personalised patient-centred care for complex patients that is

co-ordinated from the decision to offer surgery, through to the weeks and months after the procedure. It should be holistic integrated care with truly informed consent, fitness for surgery, appropriate lifestyle modifications and, finally and most importantly, knowing the risk.

In my opinion, this offers us the potential to maximise these 'teachable moments' and work with other community partners collaboratively for the benefit of the patient.

The elephant in the room

It is an undeniable fact that we do adopt a very blinkered approach in secondary care with our unquestioning acceptance of the biomedical model in perioperative medicine: if you've got a knee pain you go to a knee consultant after an initial course of physiotherapy, for back pain you need a spinal surgeon, if you develop bladder issues after spinal surgery then you go to a urologist. That approach can be very confusing for a pain patient who has pinned all their hopes on the magical curative properties of the surgery in question.

I present a typical case history of a long-term pain patient of mine and, no doubt, many of us will be able to recollect our own version of this patient.

Debbie

Debbie has now been in the pain clinic in my hospital for the better part of 8 years. It all started with a relatively innocent episode of acute low back pain at work about 8 years ago which just refused to go away. A scan at that time revealed an L4/5 disc bulge. After being told that it was the reason for her pain, she underwent four sessions of NHS physio which did not help her and this was then followed by a discectomy in 2012. This unfortunately left her with more persistent and intense low back pain with left-sided L4/5 radiculopathy.

By this time she developed knee pain, so after physiotherapy was then referred to the knee surgeon. She underwent an arthroscopy and they found medial compartment arthritic changes. Failure to respond to arthroscopy meant that she was offered a uni knee replacement in 2013. This then left her with persistent post-surgical pain in her knee.

Then she started to get shoulder pain. Guess what happened? After failing physiotherapy and medications, she was referred to a shoulder surgeon and was diagnosed to have impingement, for which she had a subacromial decompression; that seemed to work for about 3 months and then pain returned, not just in the operated shoulder but also in the other shoulder.

During this time she was also under us in the pain clinic, where we did facet joint injections followed by an epidural for her low back pain. She was then referred to London for spinal cord stimulation but ended up with an implant infection, so it was taken out.

In the interim, she developed frequent headaches and she saw the neurologists locally who diagnosed atypical migraine and put her on various migraine medications, with more side effects and marginal benefits.

By this time, over a period of 5 years, her pains had become widespread so she saw a rheumatologist who diagnosed fibromyalgia.

She had also seen the GI people with stomach problems and they made a diagnosis of IBS. She had seen the urologist for an 'irritable bladder' and offered cystoscopies.

She was on codeine, co-codamol, naproxen, tramadol, strong opiates and antineuropathics and all her symptoms and complaints stayed the same.

I took over her care 3 years ago, by which time her notes ran to three volumes. I have seen her at least eight times over this period for medication optimisation and possible injection therapy. She wasn't keen to engage with the pain management programme, citing family and personal reasons.

It had been beginning to dawn on me that I was seeing far too many Debbies in the perioperative situation; some of them for day case procedures, some on inpatient ward rounds, others in outpatients and community clinics. I became aware that regardless of whether I was working in secondary or community care I was seeing the same kind of patients with multiple, complex issues.

What were we doing? What was the real problem? Is it the process? Is it the patient? Is it the surgery?

Chronic pain after surgery

Could it be the process?

In the new NHS model of sustainable unified budget models for health and social care, it is imperative that we recognise patients like Debbie early and provide them personalised care plans for their life journey, particularly when they come into secondary care.

Locally recognising these complex patients, we obtained funding from our commissioners and set up an award-winning community pain service (Integrated Pain and Spinal Service (IPASS)).¹⁴ It was tightly integrated with our secondary care trust, had a pain consultant located in the community to integrate with the physiotherapy and psychology team, and was able to offer a wide variety of holistic therapies, including interventions/imaging where needed. While it served to recognise some less complex patients earlier and offered them a holistic multidisciplinary approach, it didn't change the trajectory of patients like Debbie necessarily.

Could it be the surgery?

So what could we do better perioperatively? There has been a big focus on using enhanced recovery pathways and regional analgesia, good surgical technique and shorter operative duration – all of this does matter, but does it reduce post-surgical chronic pain?

The incidence of post-surgical neuropathic pain after any surgery, be it gynaecological, orthopaedic or cardiothoracic, ranges from 10% to 50% for different operations.¹⁵ There are about 200,000 hip and knee replacements done every year;¹⁶ assuming 20% get chronic pain then we are expecting at least 40,000 new cases of post-surgical neuropathic pain every year!

There is still very poor evidence to say that the enhanced recovery pathway should help reduce chronic pain. We prospectively audited 100 patients in my hospital due for knee replacement in 2010 and then again in 2013 after the first cycle of the enhanced care pathway was implemented. Then in 2016, we did a retrospective survey¹⁷ of the presence of chronic pain in the operated cohort of 200 patients to see whether there was any difference in the incidence of chronic pain. Only 100 could be contacted and there were 22% of patients still with chronic, severe neuropathic pain, in line with older literature. A lot of the patients who come to the pain clinic tell me that their pain was the same before and after surgery, or even worse.

Could it be the patient?

Are we doing the right surgery for the right patient? Should GIRFT also apply to the kind of patient we choose? The biopsychosocial model is the approach that has been extensively promoted as the best alternative to the biomedical

model, but the risk is that by again having the biological and psychological aspect looked at, the social element gets overlooked to the detriment of everyone.

We know that preoperative pain at the operative site, presence of other chronic preoperative pain (e.g. headache), the occurrence of acute post-operative pain and symptoms such as anxiety, disturbed sleep, chronic stress and emotional overload/overstrain are risk factors for chronicity. These aspects can be improved by biological and psychological support preoperatively.

However, data from Canada,¹⁸ looking at the long-term trajectories after pain management programmes (PMPs), suggested that only a minority (24%) showed any improvement in the overall symptomatology of pain. Pain in the remaining 75% stayed stable or got worse. Improvers tended to be younger with less pain before intervention and less prone to anxiety and depression. The biggest difference in outcome was *the patients' view of their pain: their story of what their pain meant to them.*

A sociopsychobiological model and its application to surgical planning and the perioperative period

Newer research and neuroscience advances allow us to reframe pain as an evolutionary adaptation and chronic pain as a maladaptive process. The adoption of a sociopsychobiological model, or (if you prefer it) biopsychosocial model, requires us to accept that the Cartesian concept of mind–body separation is outdated.

Emerging research emphasises the role of chronic low-grade inflammation and traumatic stress as being a major contributor, if not a trigger, for many diverse chronic disease states in every field from nutrition to cancer and various autoimmune conditions, as well as chronic pain.

Cohen et al.¹⁹ in 2018 proposed that pain be defined as a 'mutually recognisable somatic experience that reflects a person's apprehension of threat to their bodily or existential integrity'. So anything that threatens a person's sense of self and identity and presents a danger to their survival could necessarily manifest as pain. The perception of pain as a fundamental alarm system that can get over-protective is backed by the neuroscience work of pain researchers such as Irene Tracey and Lorimer Moseley.

We know that pain is not the same as nociception and we now can better appreciate the Bayesian model of predictive processing and encoding: our brain creates a story based on a painful experience, archives it in the memory and decides what the response the next time round should be. It predicts and rearranges its prediction each time, having looked at the error rate in the last prediction.

The brain's multiple neural circuits exhibit neuroplasticity and we know that this can happen at any point in life. We also understand that there isn't a single pain centre but a matrix that is distributed all over the brain, receiving and integrating a myriad number of signals, both nociceptive and non-nociceptive. This reframe allows us to appreciate other central sensitivity syndromes such as irritable bowel syndrome (IBS), central post-stroke pain and fibromyalgia much better as a maladaptive neurocircuitry that controls and influences multiple organ systems. These syndromes get different labels within our medical system, but they are all linked to the same dysfunction in the nervous system.

Adverse childhood experiences

One key benefit, certainly for me, of this upstreamist way of looking at the new model is the appreciation of the social element and the role that adverse childhood experiences (ACEs) and developmental trauma play in the moulding of the neuroimmune system. It certainly allows for a more integrated and unified approach to many complex patients who present to our pain clinics.

The original ACE study²⁰ consisted of 10 questions that explore abuse, neglect and family dysfunction, and this was administered to the survey participants. The results consistently show, and this is irrespective of which country this was done in, that if people had experienced four or more such experiences, they had a significant increase in health care utilisation and chronic diseases including obesity, hypertension, cardiovascular disease, osteoarthritis, chronic pain and autoimmune conditions. The data are remarkably robust; while we know that correlation doesn't prove causation, the associations in studies across all health domains have been remarkably consistent.

More importantly from the pain perspective, adult victims of childhood maltreatment report more pain and headaches, GI and respiratory symptoms, gynaecological and neurological problems, greater symptom severity and utilisation of medical and surgical services. Relevant and topical issues such as bullying, #metoo, the stress of looking after children who may have health issues (autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD) etc.) themselves, road traffic accidents and litigation, poverty and other social problems are not included in the original 10 questions, so it is to be expected that the rates of chronic traumatic stress are even higher.

Debbie's ACEs

So when I last saw Debbie I took permission and administered the ACE survey, and asked her, 'Have you been abused, neglected or witnessed family dysfunction?'

She said 'Yes, my father and mother both used to hit me, and my father used to beat my mother, and went to jail for it. She was an alcoholic and he was into drugs. I was sexually abused at the age of 13. I was sometimes sent to school in unwashed clothes'.

So she ticked the boxes (apart from separation) in all the categories and had an ACE score of 9/10.

So when I looked again at the three volumes of her notes and all the conditions she had, I was forced to take stock and think:

'What would I achieve by giving her a Fentanyl patch or another facet joint injection or, for that matter, any surgery?' How should our hospitals look after patients like Debbie?

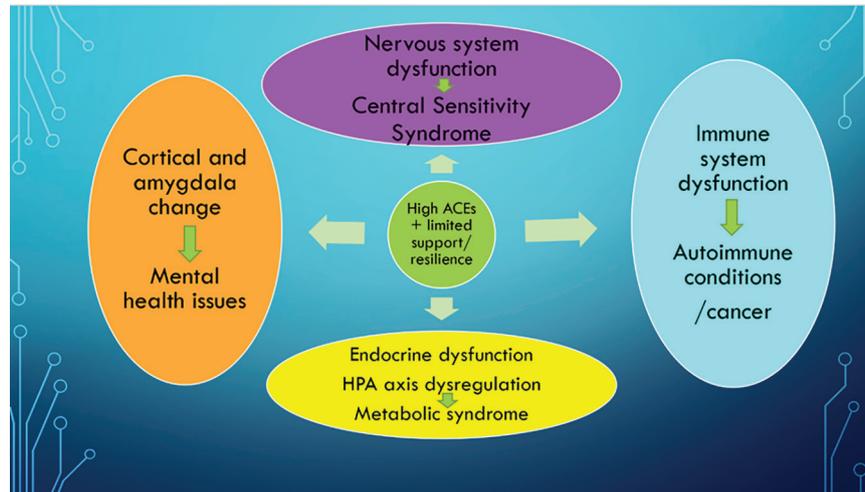
It is vital to recognise the importance of ACEs in the context of providing healthcare wisely, especially in secondary care and, all the more importantly, in perioperative care. So we as pain professionals have a much bigger role to play with our perioperative anaesthetic colleagues in working upstream with our primary care colleagues, rather than waiting at the proverbial foot of the waterfall and picking up the pieces of patients' lives after the huge amount of healthcare they have utilised with no improvement.

The picture above is an unifying concept which underpins much of health care. If you have a large number of ACEs and your resilience and ability to cope and adapt to adverse factors in your environment are poor, there is a high likelihood that

multiple biological systems in your body will be subjected to high allostatic load and will thus display consequences. Dysfunction of the nervous system can result in a wide variety of functional disorders broadly now included under the overarching umbrella of central sensitivity syndromes.

Nemeroff²¹ provides an elegant overview of the neurobiological consequences of ACEs. Dube et al.²² show that disturbances of the immune system and prolonged stress associated with proinflammatory cytokines will substantially increase the risk of developing autoimmune conditions. The adoption of high-risk behaviours and the use of biologics and other immune modulators can increase the risk of cancer.

The influence of chronic early-life stress and the persistence

Figure 1. Overarching view of the impact of significant adversity across all health domains.

Picture credit: Deepak Ravindran.

of neuroendocrine dysregulation also take their toll on the hypothalamic–pituitary–adrenal (HPA) axis, thus increasing the risk of obesity and insulin resistance and eventually cases of metabolic syndrome. This overarching concept of developmental trauma has a significant role to play in how we approach patient care in a compassionate yet sustainable manner. On average, those with high ACEs and low resilience are going to have higher mortality and die about 20 years earlier.²³

An ethically provocative viewpoint would be to ask whether we would still go ahead and do a hip or knee replacement or major general surgery on a relatively young 60-year-old with high ACEs and low resilience and support. We would ponder on fitness/suitability for surgery if the patients were in their 80s and 90s, but what about the 60-year-old with high ACEs/poor physical/mental health?

Would it make a difference to the outcome for that person if we withhold major surgery because we haven't got the systems in place for aftercare? We wouldn't think twice about delaying surgery in someone coming for hip replacement who presents with a haemoglobin of 4. Do we need to do something similar for patients with a large number of ACEs/low resilience? Would we consider a combination of high ACEs and low resilience as a mental haemoglobin of 4?

The way forward

There are already a few examples of practices that do include preoperative psychological assessment and support and they can influence care positively. They are presented below:

1. The Toronto Perioperative Care model²⁴ includes a transitional pain service for people with psychological or chronic pain issues: the pain team see them before surgery and formulate a perioperative plan including controlled use of opioids if necessary with clear boundaries; they look after them throughout surgery and send them back into the community with a further plan to be reviewed in a few months in hospital.
2. The Bournemouth pain team²⁵ implemented a psychology provision for elective hip and knee replacement and gave those who scored high a psychological intervention with physical therapy before surgery and made them aware of what to expect afterwards. Their anxiety and depression levels were much reduced, and they left hospital a day earlier.
3. Perioperative online behavioural programmes have been introduced as part of a randomised trial showing up to 56% engagement and accelerated learning and greater satisfaction and lowered post-operative opioid use. A perioperative pain psychology intervention from Stanford, called 'My Surgical Success',²⁶ aims to give patients the skills they need for breast cancer surgery as part of the perioperative plan.

Challenges

In traditional pain clinics, our main forte has been stronger medications, interventions or offering patients a 'one-size-fits-all' PMP often based on cognitive behavioural therapy or acceptance and commitment therapy models. That may not be enough for this population:

1. The age range of such patients is diverse, the factors and circumstances are unique and the effect of the trauma and the consequent behaviour is unpredictable. Their ability to pace, cope and manage their symptoms may not be improved in the typically offered six to eight sessions of an outpatient PMP especially when done as a group. Segmentation and more bespoke programmes would need to be resourced and delivered, and there needs to be an upfront understanding and clarity for patients, providers and commissioners on what are the expected outcomes that we would have to aim for.
2. Another challenge we face in trying to implement these ideas is the cognitive dissonance experienced by some of our colleagues, especially surgeons/physicians who will find it so different from what we learnt in medical schools.
3. We know that resilience is hugely important but it's not just something within patients themselves. This is not something that can be picked up in a single 1-hour self-help session. Although some people are amazingly resilient, the research²⁷ suggests that it is a product of their environment and support. Unless you have this support, you just can't be resilient enough. So providing this support is vitally important, not only in the context of pain but within a range of diseases from cancer to diabetes and stroke.
4. Financial constraints at present are daunting, however, and must be negotiated. This would need different models of care and something that spans across primary, secondary, voluntary and other stakeholders rather than just being something specialist or tertiary!

Suggestions and opportunities

1. *Preoperative screening and assessment:* Consider establishing a baseline ACE score and resilience score. Consider using a validated scale such as the Patient Catastrophising Scale (PCS). This might be acceptable for this purpose, and high scorers could be offered psychological interventions before surgery alongside physiotherapy. If the ACEs are high and there is no evidence of stable social networks, then it is worth having a multidisciplinary team (MDT) with the surgical team to reconsider whether surgery is the right thing for them at all, and whether all options have been carefully explained or explored with the patient. The research is robust enough to indicate that such patients will have psychiatric issues that are more severe and likely to be refractory to traditional pharmacotherapy and psychotherapy. Consider exploring a few preoperative models as mentioned above.
2. *Personalised planning for high-risk patients:* With the present concern raised about perioperative use of opioids and prescribing, especially post-operatively, these patients need a personalised plan that may require both acute and chronic pain teams to collaborate with the surgical team and the general practitioner (GP), as they present a higher risk of post-operative drug dependence. In the context of perioperative care, high ACE survivors who do not have the right resilience, support or empathy are sitting ducks for opioid dependence and need expert and ongoing supervision of their post-operative drug usage.
3. *PMPs that are tailored:* The 'one-size-fits-all' programmes delivered in most primary and secondary care services are inadequate for this group of patients. Behaviour change is tricky if they are not in the right frame of mind. If you have suffered significant childhood adversity, the neural circuits which mediate good prefrontal cortex and amygdala development may fail to develop appropriately and therefore affect rational thinking and often are subjected to what is termed as the 'amygdala hijack'. I have often wondered whether the high dropout rates and long-term poor outcomes we see in conventional PMP are related to our lack of understanding of the patient complexity and pre-existing mental health.
4. *Practise trauma-informed care:* ACEs are now being used more readily in social care and education and childcare sectors, so creating a trauma-informed practice and community in a secondary care area is often a powerful way to create a band of volunteers to spread the message. *The Lancet*²⁸ has identified that the WHO Sustainable Development Goals can provide the 'global developmental platform to reduce ACEs and their life course effect on health'.
5. *Probing questions:* In an outpatient clinic setting, ask one question when the symptoms don't fit easily into a nice box, such as 'What happened to you?' If the ACE score is high and support networks are fragile/non-existent, then exercise due caution in offering any intervention and medication therapy, especially opioids. If that is indeed to be considered, then ensure that entry and exit criteria for that therapy are specified.

Presented above are my 5Ps to raise awareness and identify/highlight the clinical complexity of some patients that we look after in secondary care. Hopefully this can then ignite a debate on the holistic integrated way of managing this cohort of patients. This would tie in with many secondary care organisations' strategy of closer collaborative working with primary care partners, and be a fit with the Royal College's intention for anaesthetists, pain and perioperative physicians to be more involved in population health management and enhanced perioperative care, and would present an opportunity to influence the 'lives of patients, across the life-course, for generations to come'.¹²

Conclusion

It is important to address what I feel are the Elephants in the operating room and generally in secondary care. We often talk about the epidemic of chronic pain sweeping across the globe. Since most healthcare spending occurs in specialised care, greater awareness and appreciation of the complexity of pain management of traumatically stressed patients are vitally important. Becoming trauma-informed aligns secondary care with the rest of the society and will allow us to deliver care that is truly patient-centred and integrated.

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