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## Postsurgical pain in low- and middle-income countries

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With advances in access to retroviral agents in the past two decades, the burden of disease in low- and middle-income countries (LMICs) has shifted from communicable diseases, such as human immunodeficiency virus and acquired immune deficiency syndrome, to non-communicable diseases, such as cardiovascular disease, cancer, trauma, and other disease states associated with chronic pain, including low back pain. Many non-communicable diseases require surgical intervention for diagnosis, treatment, or palliation. The proposed increase in surgical procedures in LMICs will inevitably lead to challenges in the management of postoperative and chronic pain, exactly as they have for high-income countries (HICs). We must be prepared as providers responsibly to meet the challenges that will inevitably come with progress.

### A growing surgical burden

The lack of access to basic surgical care in LMICs is a focus of advocacy and research for many organizations and individuals working within global health. It is estimated that 28% of the global burden of disease may be averted by appropriate surgery and safe anaesthesia.<sup>1</sup> However, infrastructure, personnel, and access to medications remain scarce in LMICs. Frequently, district-level hospitals remain ill equipped for basic surgical and emergency care despite World Health Organization (WHO) standards. The distance from district hospitals creates a significant disparity to the limited availability of emergency treatment.<sup>2</sup>

While nearly 232 million major surgeries are performed worldwide, only 3.5% occur in LMICs despite these countries containing more than 85% of the worldwide population.<sup>3 4</sup>

However, many efforts are underway to improve access to basic surgical care in LMICs, including the WHO Global Initiative for Emergency and Essential Surgical Care (GIEESC), the Alliance for Surgery and Anesthesia Presence (ASAPToday), and Surgeons Overseas (SOS), which have provided infrastructure surveys to inform the global community on barriers to access to surgical care.

The World Bank has published *Disease Control Priorities*, third edition, and addressed essential surgical disorders. These conditions are predominately treated by surgery (procedures and other surgical care), have a large health burden, and can be treated successfully by surgical care that is globally feasible and cost-effective. The provision of 44 cost-effective essential surgical procedures is predicted to avert about 1.5 million deaths a year, equivalent to 6–7% of all preventable mortality in LMICs.<sup>1</sup> Projects such as these will soon drastically increase the surgical volume in LMICs.

As a result of an increasing surgical burden, the incidence and prevalence of acute and chronic postoperative pain in countries with limited resources will increase proportionately. The barriers to surgical provision include limited access to essential medicines, including narcotics and other pain medicines.<sup>5</sup> Reducing barriers to appropriate opioid access for acute postoperative pain is necessary in LMICs; however, it is imperative to identify those patients with risk factors for chronicity of pain and to adjust treatment in the chronic postsurgical period accordingly. The treatment of chronic non-malignant and postsurgical pain with chronic opioid therapy is a costly burden in HICs, with dire public health implications and without robust evidence of long-term efficacy. Furthermore, \$550–635 billion is spent each year because of missed work and treatment of chronic pain in the

USA alone.<sup>6</sup> Health-care providers in LMICs should consider these factors when developing resource-conscious plans to screen and treat patients for chronic postsurgical pain in the future.

### Current chronic postsurgical pain in low- and middle-income countries

Unfortunately, the literature currently lacks well-designed studies using validated measures in the evaluation of the incidence and prevalence of chronic postsurgical pain in LMICs. Very few studies define chronic postsurgical pain as a primary outcome. Even fewer assess patient risk factors commonly associated with chronic pain, including mood disorders or pain in multiple sites. None of the studies determined whether preoperative risk factors were associated with the development of chronic postsurgical pain.

Although the literature regarding chronic postoperative pain in LMICs is extremely limited, it is reasonable to extrapolate on the more robust literature in HICs throughout the last 10–15 yr for comparison, because similar risk factors are likely to be present across cultures. A review in 2008 by Macrae<sup>7</sup> estimated the incidence of chronic pain after Caesarean section as 6%, with ~1 296 070 Caesarean sections performed each year in the USA. A single study done in an LMIC reported a post-Caesarean section chronic pain rate at 4.4%, which is slightly less, but may be significant if the rates of Caesarean section begin to climb based on the WHO initiative to prevent pregnancy-related complications.<sup>8</sup>

In the same review by Macrae,<sup>7</sup> the incidence of chronic post-herniorrhaphy pain was estimated at 5–35%. In LMICs, chronic postoperative pain after hernia repair ranged from 2.1 to 13.8% depending on the type of material used to repair the hernia.<sup>9–10</sup> Chronic pain after amputation has been strikingly estimated to be as high as 50–85% in the USA.<sup>7</sup> The limited data regarding stump pain in LMICs approaches a rate of 100% and phantom pain 17–32.5%.<sup>11–12</sup> These types of injuries along with their associated chronic pain syndromes can significantly limit a patient's ability to work; a devastating consequence in countries with limited resources. In HICs, the incidence of chronic postsurgical pain is as high as 50% in post-thoracotomy patients and 18% in gastrointestinal surgery.<sup>13–14</sup> As the WHO mandates the availability of 'essential surgery' in LMICs, we must remain cognizant of the long-term implications of increased surgical volume and complexity based on the limited data we have available. The reduced prevalence of postoperative pain in LMICs may also be secondary to a lack of adequate follow-up or assessment; acute pain is generally defined as chronic >3 months after development; it is unclear whether current surgical protocols in LMICs are creating mechanisms to follow outcomes, including pain, at these distant time points.

Research continues to support that widespread pain, fibromyalgia-type syndromes, and central sensitization are refractory to many of our treatment strategies for chronic pain in HICs.<sup>15</sup> In addition, female gender, older age, high perioperative pain scores, multiple preoperative pain sites, depression, catastrophizing, anxiety, and other psychological vulnerabilities have been shown to result in higher prevalence of chronic pain after acute injury and surgery.<sup>14–16–17</sup> Few studies in LMICs comment on chronic pain in other areas (i.e. low back pain) separate from the surgical site, despite the fact that pre-existing pain in multiple somatic sites has also been significantly associated with the development of disabling chronic pain worldwide.<sup>18</sup> None of the studies from LMICs determined whether these diagnoses had any statistically significant effect on the rates of chronic postoperative pain.

### Future directions

The third edition of the *Disease Control Priorities* highlights the need for safe essential surgical and anaesthetic care, and describes the challenges for ramping up surgical care and safely treating patients in LMICs.<sup>1</sup> The identified challenges include the paucity of options for perioperative pain management, which include opioids, non-steroidal anti-inflammatories, neuromuscular blocking agents, and adjuvant medicines such as gabapentin, pregabalin, N-methyl-D-aspartate antagonists, tricyclic antidepressants, and serotonin–norepinephrine reuptake inhibitors. Currently, the WHO list of essential medications for pain management includes lidocaine, bupivacaine, morphine, codeine, ketamine, ibuprofen, paracetamol, and amitriptyline.<sup>1</sup> The lack of availability of anticonvulsants, serotonin–norepinephrine reuptake inhibitors, neuromuscular blocking agents, and opioids (other than those listed) greatly limits the options available to pain-management providers in LMICs. Along with limited access to essential pain medications, providers may also lack experience or appropriate equipment to perform neuraxial and regional analgesic blocks. Neuraxial and regional analgesia can provide superior pain control in the postoperative period, reduce the need for opioids and other medications, and may reduce the incidence of chronic postoperative pain.<sup>14</sup>

In addition to a lack of pain medications and procedures, patients in LMICs also have fewer anaesthesia and pain-management providers to deliver these treatment strategies. A recent survey focusing on the anaesthesia workforce crisis indicated that most LMICs have less than one physician anaesthesia provider per 100 000 people.<sup>19</sup> This highlights the extreme shortage of medical professionals trained in the specialty of perioperative and chronic pain management. One suggestion to bridge this gap includes training family medicine practitioners to provide basic surgical and anaesthetic care.<sup>20</sup> With appropriate training, family physicians can safely provide basic postoperative pain management, implement appropriate chronic pain treatment strategies, and provide palliative pain relief.<sup>20</sup> Data collected from years of chronic opioid therapy in the USA will be invaluable in training family medicine physicians in LMICs to allocate the limited pain-management resources available at district-level hospitals appropriately.

In conclusion, as LMICs begin to struggle to meet the demands of growing surgical volume anticipated in recent publications from the World Bank and the WHO, it is essential that strategies for perioperative pain management be included in the perioperative assessment; furthermore, risk factors for pain chronicity should be investigated pre-emptively, so that chronic postsurgical pain can be more effectively and resourcefully anticipated and assessed. The data in the current literature are extremely limited on the incidence and prevalence of chronic postsurgical pain and contain even less information on the impact of this type of pain on disability in LMICs. These postoperative outcomes must be assessed and included in future research endeavours. Postoperative disability from chronic pain will incur a high cost and burden to the health-care and societal systems of a resource-limited country, exactly as we have seen in HICs. In some instances, the burden may negate the benefit of the surgical intervention. Moving forward, it will be imperative that physicians in LMICs recognize the risk factors for poor outcomes and treat patients who develop chronic postsurgical pain appropriately to reduce disability in resource-poor areas.

### Declaration of interest

None declared.

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# Marker or mechanism? Dysnatraemia and outcomes in the perioperative period

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In the last issue of the *BJA*, Cecconi and colleagues report that in patients presenting for major surgery, preoperative abnormalities of serum sodium concentration were common (present in 38.7% of patients with measurements), and that severe hypernatraemia was independently associated with increased mortality.<sup>1</sup> Interestingly, neither hyponatraemia (serum sodium concentration  $\leq 137$  mmol litre<sup>-1</sup>) nor mild or moderate hypernatraemia (serum sodium concentration 143–149 mmol litre<sup>-1</sup>) were associated with increased mortality. Why is this important? The findings of this study differ significantly from previous published

literature,<sup>2–5</sup> in that only hypernatraemia, and not hyponatraemia, was associated with worse outcome.

For such a commonly performed investigation, with frequently abnormal results, the lack of clarity in published literature regarding the significance of abnormal sodium concentrations is perhaps surprising. The association of abnormal serum sodium concentrations with increased morbidity and mortality has previously been reported in a variety of clinical situations, including medical and surgical patients,<sup>6</sup> patients requiring intensive care,<sup>2,7</sup> and in the perioperative period.<sup>3–5,8</sup> However, whether abnormal