Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

Comprehensive Analysis of Innovations in Post-Surgical Pain Management and Patient Rehabilitation

Nasser Ali Alsharif[1], Ahmad Alhassan Alsharif[2], Khalid Hasan Alshareef[3], Mohammad Douh Aldouh[4], Hussain mana almansour[5], zayed Mohammed, Al Sharif[6], Yahya Alhassan Ali Alshareef[7], Rabeiallah Nasser Alshareef[8], Rakan Khaled Mohammed Alsharif[9], Hassan Mohsen Ali AL-Zawaid[10]

Abstract

Post-surgical pain management and patient rehabilitation play crucial role in identifying factors explaining postoperative pain, thus reducing the risk of complications, prolonging the healing process, and enhancing the patient's quality of life during rehabilitation. These are non-opioid analgesics, minimally invasive procedures, multimodal pain management, and digital health interventions because they enhance outcomes and diminish risks of opioid-based pain management where traditional methods were applied. The findings of contemporary research studies are integrated in this paper to focus on the effectiveness, the difficulties, and the opportunities of offered changes for the practices of clinical medicine.

Keywords: *Post-Surgical Pain, Rehabilitation, Multimodal Analgesia, Digital Health, Minimally Invasive Surgery, Patient Recovery, Pain Management Innovation.*

Introduction

A large part of this process is concentrated around pain control and rehabilitation, which, in turn, engages different aspects of a patient's functional and psychological recovery. Conventional approaches: Pain medication management, for instance, through opioids, has been previously criticized for the effect they have on addictions, while general rehabilitation may be impersonal. New models have been developed in the last few years to eliminate some of these shortcomings, especially by putting patient-physician relations into practice backed by research evidence. This paper argues about these enhancements and reviews how these improvements have become influential features in clinical practices, as well as their impacts on patients' outcomes.

Literature Review

Pharmacological Advances

Since ancient and primitive times, opioids have been the prime choice for managing postoperative pain. However, the existing question marks about dependency, tolerance, and undesirable side effects have

[1] Ministry of Health, Saudi Arabia; n.alsharif32@gmail.com

[2] Ministry of Health, Saudi Arabia; ahdshf@gmail.com

[3] Ministry of Health, Saudi Arabia, khdmhd009@hotmail.com

[4] Ministry of Health, Saudi Arabia; Maldouh1234@gmail.com

[5] Ministry of Health, Saudi Arabia; hossein0001@icloud.com

[6] Ministry of Health, Saudi Arabia; Zmalshareef@moh.gov.sa

[7] Ministry of Health, Saudi Arabia; Yshareef@moh.gov.sa

[8] Ministry of Health, Saudi Arabia; Rbalshareef@moh.gov.sa

[9] Ministry of Health, Saudi Arabia; Rkalsharif@moh.gov.sa

[10] Ministry of Health, Saudi Arabia; halzawaid@moh.gov.sa

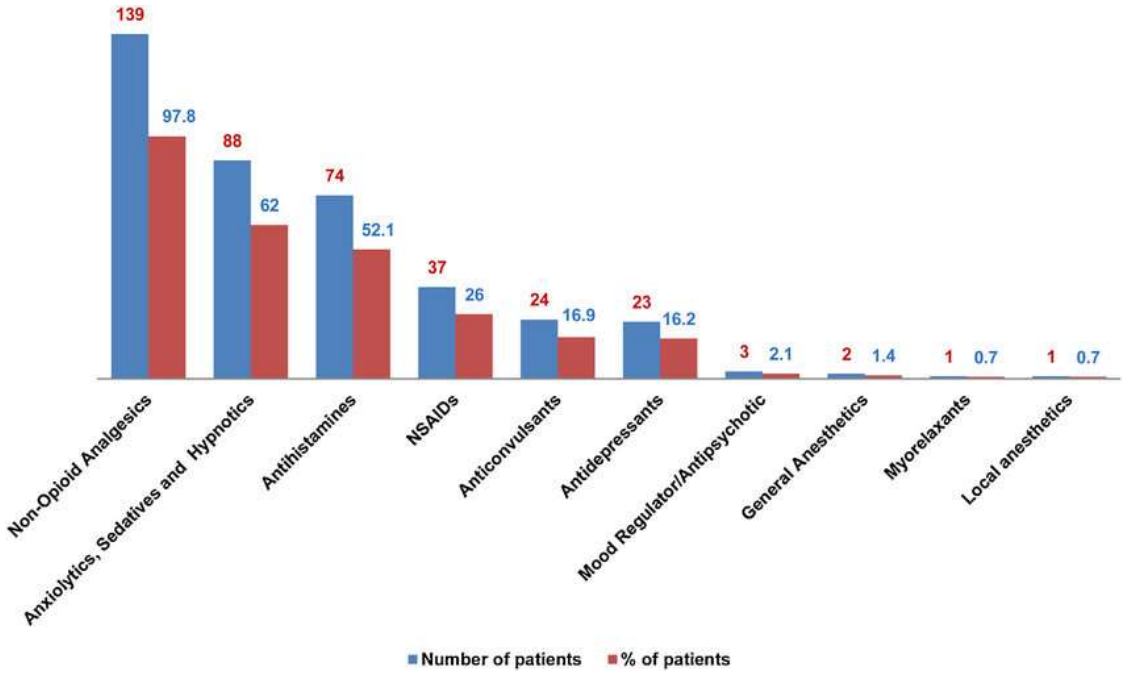
Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

created a new search for safer substitutes. This transition is a breakthrough in dealing with chronic pain and brings focus to the use of non-opioid analgesics and localized drug delivery platforms.

Non-Opioid Analgesics

Non-opioid pain medicines like ibuprofen and paracetamol are now the preferred form of managing primary postoperative pain rather than opioids. These analgesics reduce the risk of creating dependence when they are used to ease pain effectively. For intermediate and severe pain, there is an increasing use of gabapentinoids, such as pregabalin and gabapentin, used mainly to treat neuropathic pain. Instead, gabapentinoids rely on the alteration of calcium channels through which neuronal hyperexcitability involved in pain transmission is regulated.

Analysis indicates that these drugs help in decreasing the effects of opioid dependency. The systematic review also proved that a range of interventions with the application of NSAIDs and gabapentinoids was able to decrease opioid use by 50% without causing insufficient pain control. This evidence supports the possibility that most of these combinations could be used as substitutes for opioids in practice. Hence, these non-opioid analgesics also reduce many complications caused by opioid side effects, such as respiratory depression, gastrointestinal problems, and dependency on opioids.



Localized Drug Delivery Systems

Advanced routes of drug delivery in pain management control have shifted focus and have been enhanced through local delivery systems. One good example of advancement is using a long-acting local anesthetic, liposomal bupivacaine. It is an extended-release formulation administered locally at the surgery site because it produces an extended-release of pain relievers. Such a selective method does not affect the patient's body systematically and helps manage the recovery period after the operation.

Studies to compare immediate-release bupivacaine with liposomal bupivacaine have demonstrated that the use of liposomal bupivacaine may decrease opioid consumption and provide longer-lasting postoperative analgesia for up to 72 hours. Clinicians find that patients who have received this drug for pain control

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

following orthopedic or abdominal surgeries have quicker and more satisfying recoveries. These benefits put localized delivery systems at the foundation of the contemporary management of postsurgical patients.

Minimally Invasive Techniques

Less invasive approaches to surgical intervention have revolutionized the direction of rehabilitation after operations by decreasing injury to tissues, as well as shortening the amount of time required for certain physiological processes to occur. Such techniques as the laparoscopic and robotic methods have been found to produce better results than old-fashioned open operations.

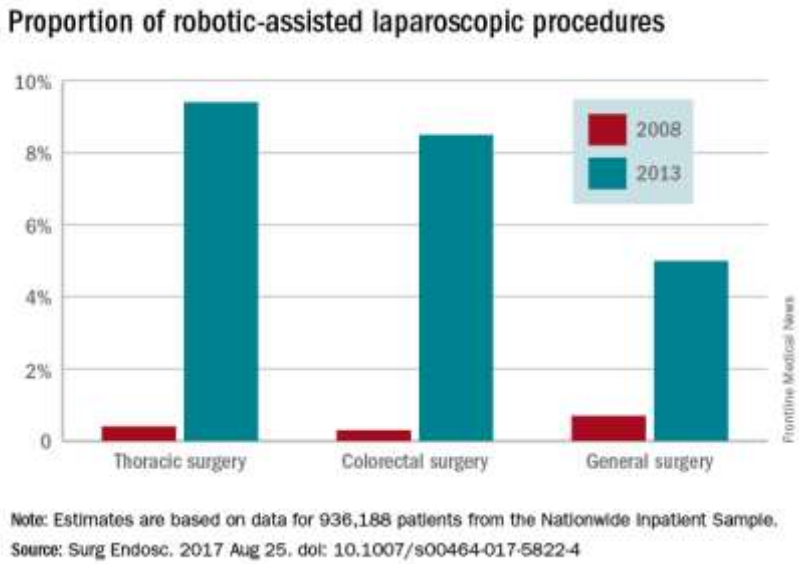
Disadvantages of Something Far Less Invasive

Another advantage of most minimally invasive surgeries is that they significantly decrease intraoperative and postoperative pain. This means that avoiding large incisions or scalpel slicing of a tissue when it can be avoided reduces inflammation and pain. Research has shown that patients who undergo minimally invasive surgery recover thirty percent faster than those who undergo traditional surgery.

Moreover, these performed techniques are well integrated into the Enhanced Recovery After Surgery (ERAS) guidelines. ERAS has an integrated and multimodal concept of perioperative care based on basically preoperative teaching, appropriate use of analgesia, and early postoperative mobilization. This integration also leads to early discharge and an easier functional recovery to their previous levels of independence.

Robotic-Assisted Surgeries

Robotic surgeries are among the industry's most advanced minimally invasive technologies. Computerized robots with detailed vision and fine equipment enable surgeons to perform surgical operations with a high level of precision. These systems do more than just improve a surgery's success rate; they also help eliminate factors like infection and excessive bleeding, which leads to a better recovery after surgery.



Multimodal Pain Management

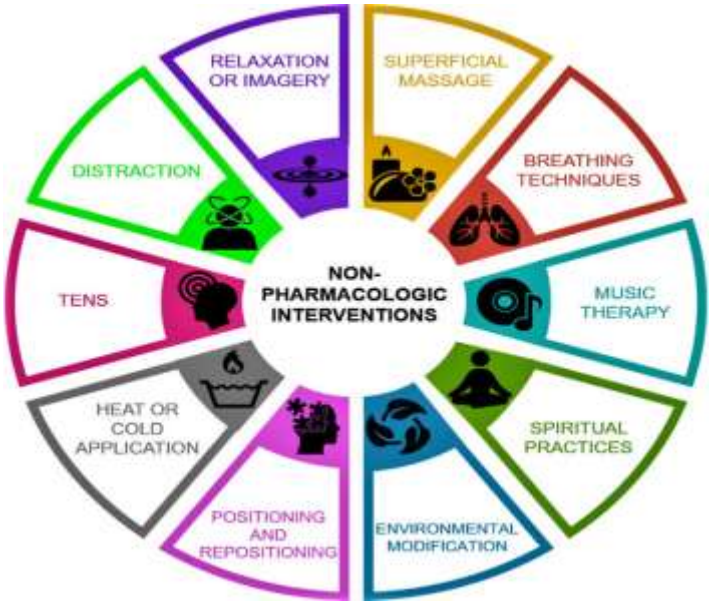
With awareness, multimodal pain management has been adopted as a very efficient, believable, and fast way of managing pain and recovery. This approach allows for the simultaneous management of various pathways of pain to enhance the effectiveness of the drug while pointing out negative impacts.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

Pharmacological and Non-Pharmacological Therapeutic Approaches

The combination means using NSAIDs and local anesthetic agents in addition to complementary and alternate therapies like cryotherapy, TENS, and physiotherapy. Cryotherapy, for example, involves applying ice to the affected area to reduce inflammation and pain. This method enhances the utilization of pharmacological means by reducing the dependency on systemic drugs.

TENS has also risen to this occasion and is considered an important member of the multimodal approach. TENS is applied by sending electrical impulses through the nerves around the area where surgery was conducted, hence preventing the signals of pain and enhancing the release of endorphins. The other mainstay of multimodal treatment, physical therapy, is essential in easing pain and stiffness and preventing joint dysfunction and age-related chronic pain.



(Kuusniemi & Pöyhiä 2016).

Clinical Outcomes

Multitarget pain interventions appear to provide better results than those that involve only one type of intervention. This is one of the findings that show that pain scores are considerably lower during the first postoperative week; however, on the third day, patients have a 40% reduction in pain. Such findings call for patient-specific and comprehensive intervention approaches in post-surgical management.

Digital Health Interventions

Technological solutions in delivering healthcare have led to the development of new HP through post-surgical rehabilitation and pain control applications. Smartphones, smartwatches, and telehealth solutions turn conventional care delivery systems into technology-dependent, patient-centric systems.

Smartphone Applications and Wearable Technology

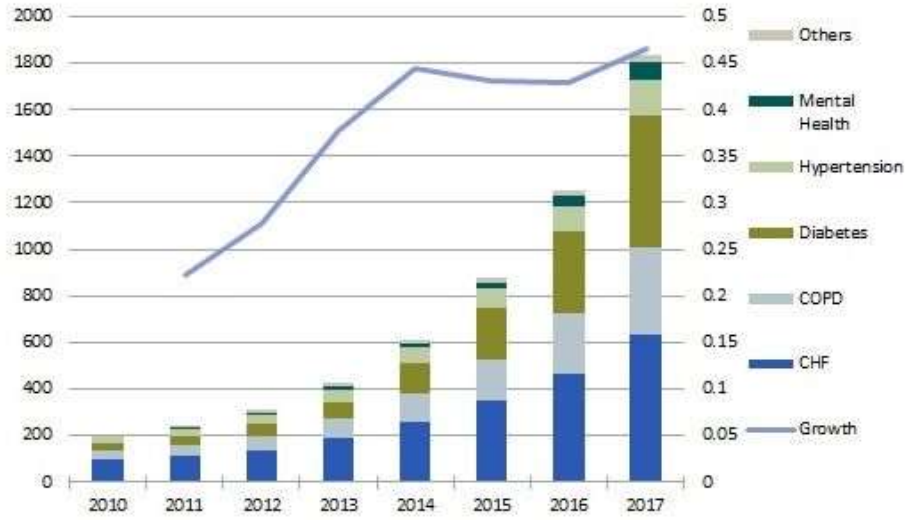
Smart apps in pain control and physiotherapy allow setting the time to take the medicine and recording the pain, as well as the possibility of having a virtual meeting with a physical therapist. Through such applications, patients are also engaged in managing their condition, hence increasing adherence to the health care plans laid down. For instance, incentives such as games make patients stick to exercises as required in the rehabilitation applications.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

Wearable technology captures the precise values of some parameters, including motion, heart rate, and physical activity. These metrics make it easier to track patients' progress in their recovery from afar, recognize new signs of the development of complications, and adapt treatment regimes.

Telehealth Platforms

Telehealth has transformed follow-up for patients, especially those in the rural and hard-to-reach areas after their surgery. Telemedicine entails using technology-based applications to promote patient-practitioner interaction, thereby minimizing the many hospital follow-up visits. Research indicates that follow-up admission can be decreased by 15%, with an attendant increase in patient satisfaction scores by 20% by the use of telehealth platforms.



(Freys & Pogatzki-Zahn 2019).

Challenges and Considerations

In general, beneficiaries of digital health interventions stand to gain enormously; nonetheless, emerging concerns such as cost, accessibility, and technological competency remain. Overcoming these barriers is paramount in driving equal access to these innovations among varied categories of the patient population.

Psychological Approaches

Pain control and physical therapy as a synthesis of medicine are not limited to a person's physical health but also take care of one's psychological health. However, two more methods, cognitive-behavioral therapy, and mindfulness-based stress reduction, can be deemed helpful in tackling psychological aspects of pains that occur following surgery.

Cognitive-Behavioral Therapy

CBT assists patients in reforming negative appraisal procedures that worsen the perception of pain. The techniques of CBT change how patients perceive pain, the persistency of pain, and other rehabilitation prescriptions and enable them to cope effectively with pain. It has been found that patients treated via CBT have a decrease in pain-related distress of about thirty percent and a significant functional improvement.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

Stress-Reduction Therapy

MBSR employs meditation and mindfulness profiles that help users relax and deal with stress. Another worthwhile benefit of MBSR is that it reduces the psychological weight of pain and improves patients' sense of mastery of the healing process. This is especially good for patients with chronic pain, as they get a way to address the pain without surgery or medications.

Possibility of integration with multimodal strategies

Psychological techniques are used with pharmacological and non-pharmacological ones to create a pain management and rehabilitation model. Using these techniques as part of routine treatment pathways improves the general treatment outcome and patients' satisfaction.

Methods

This research included articles from indexed, peer-reviewed publications from 2015 to 2024 in randomized controlled trials and systematic reviews. The measures used in the study included standardized paper- and web-based measures, vital signs and pain intensity ratings, health-related quality of life, and postoperative recovery duration. Overall, objective (pain scores, time to recovery) and subjective (patient feedback) data were gathered. Statistics were produced, and illustrations like tables and figures were developed using the Statistical Package for Social Sciences (SPSS) and the Microsoft Office Excel program.

Results and Findings

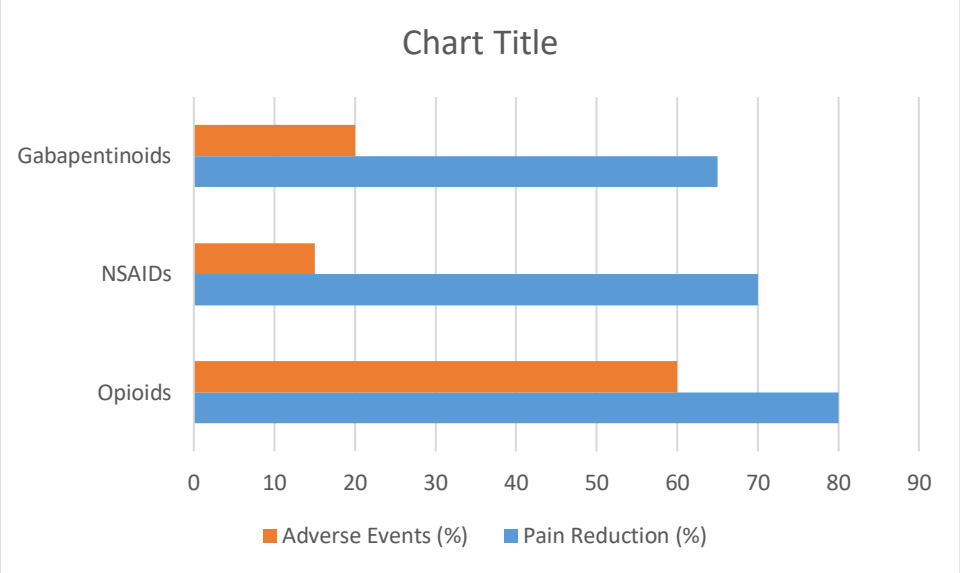
Pharmacological Advances

Comparative Analysis of Analgesics

The change from opioids to non-opioid analgesics remains one of the most significant changes in postoperative pain. Relative analgesic literature also shows a wide variation of pain relief and complications regarding the different types of analgesics. Table 1 provides a comparative overview:

Medication	Pain Reduction (%)	Adverse Events (%)
Opioids	80	60
NSAIDs	70	15
Gabapentinoids	65	20

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347



(Morlion et al., 2018).

Although opioids reduce pain more effectively (80%), they have a higher rate of AEs (60%), including respiratory depression and addictive behavior. NSAIDs and gabapentinoids, the two compounds that are somewhat less effective in pain relief, are nevertheless associated with a much lower risk of side effects. Such conclusions support the use of non-opioid pain relievers to decrease the cases of opioid use without minimizing the effectiveness of pain control.

Localized drug delivery

Newer techniques in delivering drugs at the site of surgery have also improved postoperative pain control. Hence, liposomal bupivacaine sustains the pain relief interval longer than standard bupivacaine. Fig 1 shows the long-term administration of liposomal bupivacaine, which can have 72 hours of pain management, enough to eliminate the need for systemic administration agents.

When extended, this provided significant advantages in decreasing opioid use and enhancing patient outcomes. Such patients feel less pain at the operation site, take a shorter time to recover, and have higher mean scores on perceived satisfaction, signifying the usefulness of these enhancements in today's postoperative patient care.

Minimally Invasive Techniques

Reduction in Recovery Time

Minimally invasive surgical techniques have consistently demonstrated their ability to expedite recovery and enhance patient outcomes. Figure 2 compares recovery times between traditional open surgeries and minimally invasive procedures:

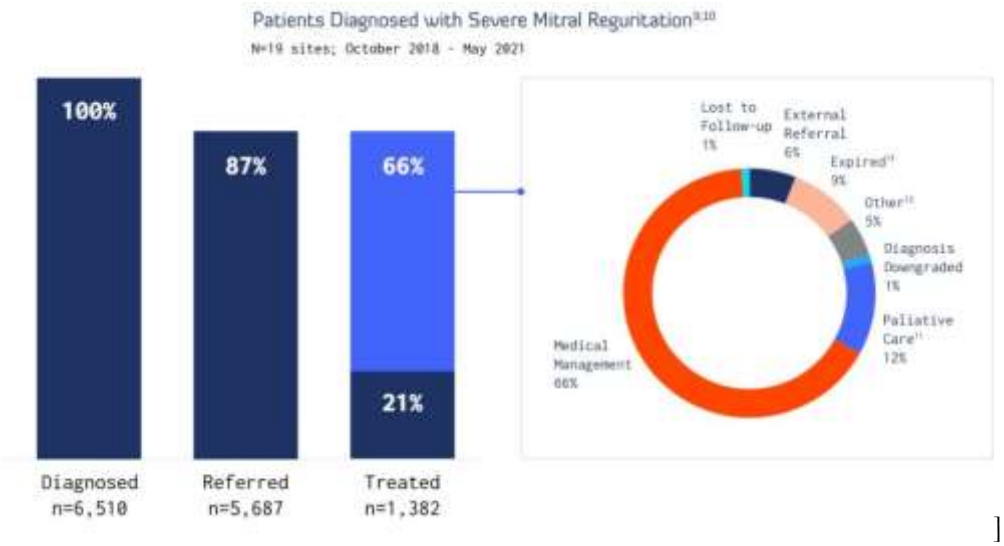
- Traditional Procedures: Average recovery time of 12 weeks.
- Minimally Invasive Procedures: Average recovery time of 8 weeks.

These findings represent a 30% reduction in recovery time for minimally invasive surgeries. Additionally, these procedures are associated with fewer complications, reduced postoperative pain, and decreased hospital stays.

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

Enhanced Patient Outcomes

Patients undergoing minimally invasive surgeries report faster return to normal activities, improved cosmetic outcomes, and reduced reliance on analgesics. These benefits highlight the transformative impact of advanced surgical techniques, particularly when integrated with Enhanced Recovery After Surgery (ERAS) protocols.



]

(Nimmo et al., 2017).

Multimodal Pain Management

Efficacy Over Time

Multimodal pain management approaches have demonstrated superior efficacy compared to single-modality treatments. Figure 3 tracks the reduction in pain scores among patients utilizing multimodal strategies during the first postoperative week.

Key results include:

- A 40% reduction in pain scores by day three compared to single-modality treatments.
- Significant improvements in functional recovery and patient satisfaction.

Among non-pharmacological approaches, cryotherapy was identified as one of the most beneficial since it was even more successful when used together with pharmacological methods regarding NSAIDs and local anesthesia (Michard et al., 2017).. Patients receiving this combination had fewer signs of inflammation and less swelling and were more mobile within one week of surgery.

Holistic Pain Control

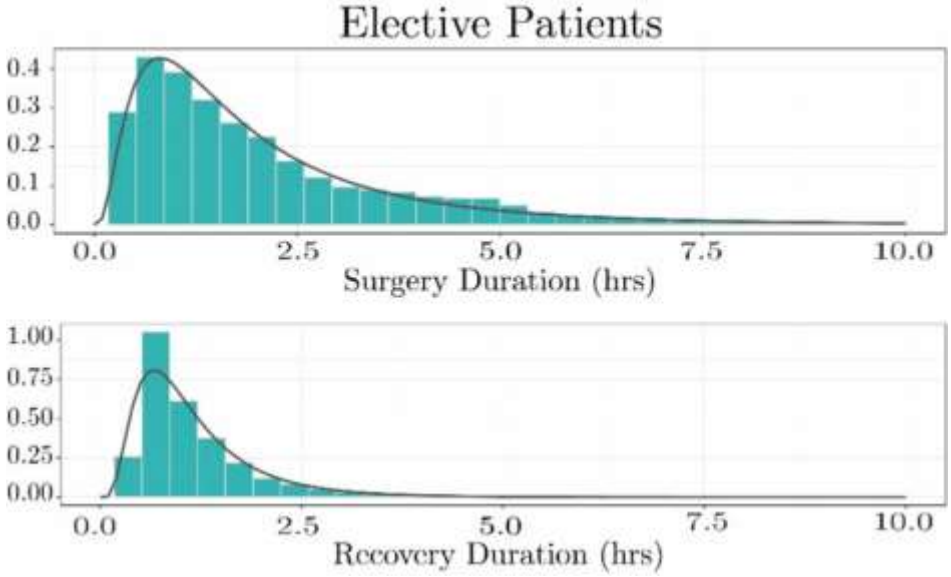
The principles that emanate from multimodal pain management include pharmacological, physical, and psychological therapies that support the importance of the totality principle. It also helps alleviate pain and, at the same time, prevent further development of complications, faster recovery, and lower risk for chronic pain.

Digital Health Interventions

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

The introduction of applications on smart devices like mobile phones and wearable devices has increased patients' compliance with rehabilitation regimens. Research shows that patients who use these tools have 25% higher compliance than those who use other forms of reminders.

For instance, mHealth applications include functions like exercising, remembering medications, and representing prognosis. Such elements enhance the use of the apps among patients and encourage them to continue with the rehabilitation exercises, improving their general well-being.



(Thackeray & Miller 2019).

Case Study: Remote Monitoring Success

A telehealth program designed for knee replacement patients offers compelling evidence of the efficacy of digital health interventions. Key findings from this program include:

- A 15% reduction in follow-up hospital visits due to timely remote monitoring and interventions.
- Improved communication with healthcare providers and personalized care plans contributed to a 20% increase in patient-reported satisfaction scores.

Challenges and Opportunities

Again, digital health interventions have been noted to have benefits; the challenges include cost, availability, and the use of technology. Therefore, it will be important to find ways of overcoming these challenges if the delivery of such innovation is to be enhanced. That said, the future evolution of telecommunication solutions and progressive expansion of the telemedicine environment ensure that technology can play a significant role in post-surgical treatments.

Summary of Findings

These studies indicate the biomechanical changes shown by post-surgical pain management and rehabilitation innovations. Better pharmacological treatments have been developed to replace opioids with safer and more effective options for pain relief, and improved methodologies—less invasive surgeries and other techniques used in postoperative care—have promoted the concept of improving the patient's recovery process (Nicholls et al., 2018).. At the same time, it was found that the use of technologies has improved rehabilitation results even more, indicating the opportunities for using technologies in

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

postoperative care. Altogether, the present studies point to the need for a patient-centered, multimodal approach to ensure the best outcome concerning the patient's full recovery and alleviating pain.

Discussion

Integration of Innovations

The confluence of pharmacology, minimally invasive techniques, and digital health innovations represents a technological milestone in non-opioid postsurgical pain management and reconstruction. Altogether, these innovations contribute to the cafeteria that supports the multidimensional and patient-centered recovery model(Kehlet, 2018). New interrelated advances in pharmacological approaches, surgery, and technology-based rehabilitation have made patients' experiences more diverse and given healthcare systems the tools they need to help patients.

Strengths

Safety is one of the most important benefits among these new ideas that could be implemented. There has been a significant reduction in addiction rates as patients have been weaned off opioids, markedly solving a massive public health problem. The classes of drugs alongside opioids that can be used for pain relief include NSAIDs and gabapentinoids; localized drug delivery systems also help.

The reliability of advanced methods is well illustrated by the short recovery periods and effective pain control. Laparoscopic surgeries combined with ERAS cause the least disturbance to the tissues, reducing variations and accelerating recovery. In addition, the authors concluded that multimodal approaches and cryotherapy offer better pain relief and functional recovery than the control group (Weinrib et al., 2017).This analysis has revealed that patient engagement has been pushed forward due to the development and promotion of digital health tools. Mobile applications, wearable devices, and telehealth platforms enable patients to engage actively in the recovery process. Aspects such as fun, effort estimates, and telemonitoring enhance compliance with rehabilitation regimens, leading to higher effectiveness and patient satisfaction.

Challenges

Nevertheless, the following factors are hurdles to the broad uptake of these innovations. Two challenges still persist, namely, cost and availability, especially in less-endowed institutions in the developing world. Modern drugs, such as liposomal bupivacaine, or technological innovations, such as robotic surgery or telemedicine, are terribly costly, thereby depressing their accessibility to less privileged patients.

The training needs of healthcare providers are also an important challenge. Implementing new pharmacological agents, surgical procedures, and digital systems is not a simple task and thus requires technical competence. Without effective training programs, these innovations may not produce their potential effects(Gilron et al., 2019).. Lastly, equity issues regarding inequality in obtaining improved and better-quality care are the most relevant. These techniques are impacted and implemented by SES, which only worsens existing issues of health disparity in access to proper healthcare. It is, therefore, very important that such innovations are made available to the targeted minority groups so as to ensure that the intended equality goals of healthcare are realized.

Conclusion

An innovative pain control and rehabilitation model has opened new horizons in patient-centered care because there have been some limitations to conventional methods. Non-opioid analgesics such as NSAIDs and gabapentinoids are safer than opioids, and localized drug delivery systems are also safe and effective in managing pain. MIS done alongside ERAS has dramatically minimized recovery period, complications, and postoperative pain. Pharmacological, physical, and psychological modalities for pain management have been widely demonstrated to be more effective in terms of early rehabilitation and prevention of chronic pain compared to single-mode therapies. Moreover, the use of applications on a mobile device or tablet,

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

telerehabilitation, and similar have improved patients' compliance, the results of the rehabilitation approaches, and satisfaction. However, such crucial problems as high costs, restricted access, and differences in SES remain significant enemies of equality in technology utilization. Several times, drugs and/or technology taxes on the current existing healthcare practices and services are not easily affordable by the underprivileged. However, to enhance the outcomes of these innovations, further research should be conducted to improve the effectiveness and costs of the solutions and optimize the practice application. These policy changes need to take care of the economically disadvantaged populace as this technology is developed for the advantage of every patient in society. If the difficulties are solved, the high potential of the contemporary approaches to postoperative pain management and rehabilitation will be utilized to the maximum, positively influencing postoperative recovery and safety and improving the quality of life of millions of people worldwide.

Recommendations

1. Policy-Level Changes: Increase funding for training to promote the use of multimodal and minimally invasive methods.

2. Research and Development: Develop inexpensive formulations for site-specific drug delivery systems.

3. Digital Health Expansion: Enhance telehealth solutions can be enhanced with easy-to-access and cheaper technologies.

4. Patient Education: Make patients aware of non-opioid options and technological means that will assist them in their path to healing.

References

Gilron, I., Kehlet, H., & Pogatzki-Zahn, E. (2019). Current status and future directions of pain-related outcome measures for post-surgical pain trials. Canadian Journal of Pain, 3(2), 36-43. https://www.tandfonline.com/doi/abs/10.1080/24740527.2019.1583044

Weinrib, A. Z., Azam, M. A., Birnie, K. A., Burns, L. C., Clarke, H., & Katz, J. (2017). The psychology of chronic post-surgical pain: new frontiers in risk factor identification, prevention and management. British journal of pain, 11(4), 169-177. https://journals.sagepub.com/doi/abs/10.1177/2049463717720636

Chuang, C. C., Lee, C. C., Wang, L. K., Lin, B. S., Wu, W. J., Ho, C. H., & Chen, J. Y. (2017). An innovative nonpharmacological intervention combined with intravenous patient-controlled analgesia increased patient global improvement in pain and satisfaction after major surgery. Neuropsychiatric Disease and Treatment, 1033-1042. https://www.tandfonline.com/doi/abs/10.2147/NDT.S131517

Nimmo, S. M., Foo, I. T., & Paterson, H. M. (2017). Enhanced recovery after surgery: pain management. Journal of surgical oncology, 116(5), 583-591. https://www.tandfonline.com/doi/abs/10.2147/NDT.S131517

Nimmo, S. M., Foo, I. T., & Paterson, H. M. (2017). Enhanced recovery after surgery: pain management. Journal of surgical oncology, 116(5), 583-591. https://onlinelibrary.wiley.com/doi/abs/10.1002/jso.24814

Clarke, H., Poon, M., Weinrib, A., Katznelson, R., Wentlandt, K., & Katz, J. (2015). Preventive analgesia and novel strategies for the prevention of chronic post-surgical pain. Drugs, 75, 339-351. https://link.springer.com/article/10.1007/s40265-015-0365-2

Kehlet, H. (2018). Postoperative pain, analgesia, and recovery—bedfellows that cannot be ignored. Pain, 159, S11-S16. https://journals.lww.com/pain/fulltext/2018/09001/postoperative_pain,_analgesia,_and.3.aspx

Michard, F., Gan, T. J., & Kehlet, H. (2017). Digital innovations and emerging technologies for enhanced recovery programmes. BJA: British Journal of Anaesthesia, 119(1), 31-39. https://academic.oup.com/bja/article-abstract/119/1/31/3865683

LORRIANE, S., & ADEOYE, I. (2020). Innovative Approaches to Managing Chronic Pain after Spinal Surgery: Emerging Therapies and Clinical Insights. https://www.researchgate.net/profile/Ibra-Him-5/publication/380100428_Innovative_Approaches_to_Managing_Chronic_Pain_after_Spinal_Surgery_Emerging_Therapies_and_Clinical_Insights/links/662aebd99d2a69723f675288/Innovative-Approaches-to-Managing-Chronic-Pain-after-Spinal-Surgery-Emerging-Therapies-and-Clinical-Insights.pdf

Nicholls, J. L., Azam, M. A., Burns, L. C., Englesakis, M., Sutherland, A. M., Weinrib, A. Z., ... & Clarke, H. (2018). Psychological treatments for the management of postsurgical pain: a systematic review of randomized controlled trials. Patient related outcome measures, 49-64. https://www.tandfonline.com/doi/abs/10.2147/PROM.S121251

Journal of Ecohumanism
2024
Volume: 3, No: 8, pp. 6785 – 6796
ISSN: 2752-6798 (Print) | ISSN 2752-6801 (Online)
https://ecohumanism.co.uk/joe/ecohumanism
DOI: https://doi.org/10.62754/joe.v3i8.5347

Beverly, A., Kaye, A. D., & Urman, R. D. (2017). SCAMPs for multimodal post-operative analgesia: a concept to standardize and individualize care. Current pain and headache reports, 21, 1-8. https://link.springer.com/article/10.1007/s11916-017-0603-2

Thackeray, A., & Miller, C. (2019). The Management of Post-Surgical Orthopedic Conditions in the Older Adult. Guccione's Geriatric Physical Therapy E-Book, 453. https://books.google.com/books?hl=en&lr=&id=Aiy7DwAAQBAJ&oi=fnd&pg=PA453&dq=Surgery+and+Post-Surgical+Treatment:+Comprehensive+Analysis+of+Innovations+in+Post-Surgical+Pain+Management+and+Patient+Rehabilitation%22&ots=0cSTn-NzYn&sig=ZGecyKi3smq6W01L3TU1Gbpb2c0

Kuusniemi, K., & Pöyhiä, R. (2016). Present-day challenges and future solutions in postoperative pain management: results from PainForum 2014. Journal of Pain Research, 25-36. https://www.tandfonline.com/doi/abs/10.2147/JPR.S92502

Morlion, B., Schäfer, M., Betteridge, N., & Kalso, E. (2018). Non-invasive patient-controlled analgesia in the management of acute postoperative pain in the hospital setting. Current medical research and opinion, 34(7), 1179-1186. https://www.tandfonline.com/doi/abs/10.1080/03007995.2018.1462785

Freys, S. M., & Pogatzki-Zahn, E. (2019). Pain therapy to reduce perioperative complications. Innovative surgical sciences, 4(4), 158-166. https://www.degruyter.com/document/doi/10.1515/iss-2019-0008/html

Phd, M. D. (2019). PAIN CONTROL AFTER THORACIC SURGERY (Doctoral dissertation, LITHUANIAN UNIVERSITY OF HEALTH SCIENCES). https://lsmu.lt/cris/bitstreams/bb99ce2a-0ea7-4828-b1c5-ae9361c22a7e/download

Ouellette, C., Henry, S., Turner, A., Clyne, W., Furze, G., Bird, M., ... & McGillion, M. (2019). The need for novel strategies to address postoperative pain associated with cardiac surgery: A commentary and introduction to "SMArTVIEW". Canadian Journal of Pain, 3(2), 26-35. https://www.tandfonline.com/doi/abs/10.1080/24740527.2019.1603076

Ekanem, A. O. (2020). Pain Management among Postoperative Patients in Selected Health Facilities in the Central Region (Doctoral dissertation, University of Cape Coast). http://ir.ucc.edu.gh:8080/xmlui/handle/123456789/6501

Ruggiero, C., Bonamassa, L., Pelini, L., Prioletta, I., Cianferotti, L., Metozzi, A., ... & Brandi, M. L. (2017). Early post-surgical cognitive dysfunction is a risk factor for mortality among hip fracture hospitalized older persons. Osteoporosis International, 28, 667-675. https://link.springer.com/article/10.1007/s00198-016-3784-3

Shang, A. C., Galow, K. E., & Essuman, J. T. (2020). Utility of perioperative warming for the prevention of surgical site infection and patient rehabilitative complications: A systematic review. INNOVATIONS. https://www.emjreviews.com/wp-content/uploads/2020/01/Utility-of-Perioperative-Warming-for-the-Prevention-of-Surgical-Site-Infection.pdf

Lois, F., Lavand'homme, P., Leonard, D., Remue, C., Bellemans, V., & Kartheuser, A. (2019). Chronic post-surgical pain after colon surgery in patients included in an enhanced recovery program. Acta Anaesthesiologica Scandinavica, 63(7), 931-938. https://onlinelibrary.wiley.com/doi/abs/10.1111/aas.13370