

Intentional physical self-injury in Auckland: patterns, associations and clinical implications in a single-centre cross-sectional study

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ABSTRACT

INTRODUCTION: Intentional physical self-injury (IPSI) is a pressing health challenge and there is little awareness of injury patterns, management and outcomes. This study examines IPSI's epidemiological and clinical aspects in one major Auckland hospital, highlighting demography, injury patterns and implications for clinical practice and prevention.

METHODS: Using Auckland City Hospital Trauma Registry data, a retrospective, descriptive study was conducted covering adult patients admitted from January 2015 to December 2019. It assessed demographic characteristics, injury patterns and outcomes, using Mann-Whitney U tests, Fisher's exact tests and Chi-squared tests.

RESULTS: Among 137 IPSI admissions, 92 (67%) required surgery, and 24% experienced post-operative complications. Major trauma was identified in 39 (28.5%) admissions. Discharge destinations varied, with only 64 (47%) patients returning home unassisted. Injury severity did not significantly vary across sex, age or injury event location. Major injuries often resulted from falls (19 of 39) and minor injuries from lacerations/stabs (73 of 98).

CONCLUSIONS: IPSI represents a significant challenge to Auckland health services, with a notable burden of care. The study highlights the need for targeted interventions to reduce the incidence of IPSI and improve outcomes. It underscores the importance of multi-disciplinary approaches to care, integrating surgical, mental health and rehabilitative services.

The New Zealand Injury Prevention Strategy (NZIPS) identifies suicide and intentional self-harm as one of the six priority areas for national injury prevention.¹ To date, there has been no comprehensive assessment conducted in New Zealand of patients with intentional physical self-injury (IPSI). IPSI and self-harm, which encompasses a range of behaviours irrespective of the apparent intent to die, remain significant predictors of suicidal behaviour and

poor mental health outcomes.^{2,3} Individuals with a history of self-harm are at a considerably higher risk of suicide, with a recent estimate of 20 self-harm episodes for each suicide death annually.⁴ Often viewed as categorically separate, self-harm and suicide are closely related across intervention and prevention metrics.⁵ From 2015 onwards, an increase in self-harm presentations to the trauma service was on the rise, with almost double the admissions seen at the end of the 5-year period.⁶

Table 1: Self-harm admissions per year to the Auckland City Hospital Trauma Service from 2015–2019.

Year	Admissions	Per 100,000 people
2019	21	1.9
2018	25	2.3
2017	29	2.3
2016	29	2.6
2015	37	2.6

In New Zealand, a history of self-harm is identified as a potential predictor of future suicidal behaviours, with toxic substance use and physical self-injury being the primary modes of self-harm.⁷ Surgeons and trauma specialists are often the first point of contact for patients who have a broad range of self-inflicted physical injuries.⁸ They are at the forefront of self-harm care alongside emergency, primary health and mental health services. Despite significant public health concern and concerted efforts, the country continues to report particularly high rates of suicide and self-harm, especially for its youth and Indigenous Māori population.^{1,9} With a median age of 29, younger New Zealanders are over-represented.⁷ Official reports suggest that the true incidence of intentional self-harm in New Zealand is higher than what is formally recorded, with depressive disorders being the leading cause of years lived with disability (YLDs).^{7,10} There is also inconsistency in data collection and coding, which may potentially under-estimate the true burden of self-harm, highlighting the need for improved data collection and reporting systems.

Globally, physical self-injury trends are heterogeneous across various regions and demographics; however, there is clear indication that physical forms of self-injury are associated with significant psychological distress and comorbidity.¹¹ Similar over-representation of Indigenous and youth populations are seen in Australia, although there is a lack of a standardised approach to data collection and coding.¹² Studies indicate that there is significant variability in the management of self-harm patients, both from a mental health and a surgical perspective.^{13,14} IPSI patients often have severe injuries that require substantial health resources in the initial and long-term period.^{13,15} When committed with intent, such injuries are more severe than if occurring unintentionally.¹⁵ The costs associated with treating these injuries are significant, indicating a need for efficient resource allocation.

There is also a growing recognition of the need for improved data collection and real-time surveillance systems to inform effective interventions as accurate data is crucial for understanding the epidemiology of self-harm, guiding interventions and ultimately improving patient outcomes.¹⁶ New Zealand therefore requires improved surveillance and reporting systems for intentional self-harm to guide public health interventions effectively, with heterogeneity among certain sub-groups that may require

targeted approaches.^{9,17} This study aims to take the first step in exploring the injury patterns associated with IPSI and in providing a descriptive baseline of IPSI management and outcomes, particularly focussing on a single-centre experience. By establishing a descriptive baseline for IPSI management and outcomes, a benchmark can be developed as a foundational reference point that future research can build upon.

The primary objective of the study is to describe the epidemiology and injury characteristics of these patients, and secondarily to describe the differences in major and minor injuries, as well as the management of the patients.

Methodology

This retrospective descriptive study aimed to identify and characterise IPSI patients admitted to Te Toka Tumai Auckland – Auckland City Hospital (ACH) from 1 January 2015 to 31 December 2019. The STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) checklist for cross-sectional studies was used in the reporting of this observational study.¹⁸ The authors hypothesised that IPSI would have distinct injury types and patterns and perform poorly across all objectives—especially with more severe injuries.

ACH was deemed a suitable centre as it serviced the sizable demographic of both the Auckland Central and Waitemata districts at the time, which had a combined population of approximately 1.1 million.^{19,20} IPSI was defined as deliberate injury or destruction of one's own body tissue. Drowning, burns and ingestion of toxic substances were excluded, as their primary management did not consistently involve the trauma service, and patients would often be directly admitted to nonsurgical services or transferred to other centres (e.g., specialist burns services). Ethics approval for the retrospective data review was provided by the Northern B Health and Disability Ethics Committee (reference 20/NTB/58), a decision made through the Full Review pathway. The study utilised data from the ACH Trauma Registry, which has been collecting comprehensive patient data since 1994, making it one of the most detailed and long-standing registries of its kind in New Zealand.⁶

The ACH trauma registry, utilising Collector® software, was accessed for a cohort of patients admitted between and inclusive of the years 2015 to 2019. A formal report was generated for admissions under the Auckland trauma service with the filter query

“SELF HARM” and “SELF INFLICTED”. Excluded from the study were patients who did not meet the defined IPSI criteria, those under the age of 15, delayed presentations exceeding 7 days post-injury, burns, hangings, drownings and patients transferred from another hospital. The paediatric population was excluded as they would directly present to Starship Children’s Hospital, which has a separate trauma team and pathways. The data retrieved were from coded medical records submitted and recorded by health professionals. All hospitalisations were coded using the International Statistical Classification of Diseases and Related Health Problems, Australian Modification (ICD-10-AM). Data accessed included patient demographics (age, sex, employment, address) and injury characteristics (aetiology, geographic location, mortality, inpatient complications, length of stay [LOS] and discharge destination). The Injury Severity Score (ISS) of each patient was extracted and calculated upon the Abbreviated Injury Scale 1998 ordinal scale.⁶ This was grouped into major (ISS >15) and minor (ISS 15 or less) injuries. Statistical analysis and graphical representation were conducted using Microsoft Excel and the Microsoft Data Analysis Toolpack plug-in. For all continuous variables, the median and interquartile range (IQR) were used. The Kolmogorov–Smirnov test of normality was used to determine sample distribution, the majority of which was non-parametric. The Fisher’s exact test (for smaller sample sizes) and Mann–Whitney U test were employed to compare ordinal or continuous data, and categorical variables were compared using the Chi-squared (χ^2) test. A p-value ≤ 0.05 signified a statistically significant result.

Results

Demography

Within the 5-year period examined, there were approximately 8,500 total trauma admissions, with 141 admissions meeting the inclusion criteria for IPSI; however, four were excluded due to incomplete data available. This left 99 male and 38 female patients with a sex ratio (male to female) of 2:6:1. The median age of patients was 33 years (IQR 24–51) with ages ranging from 15 to 91 years. Students and unemployed persons comprised 15% (n=20) and 37% (n=51) of the IPSI cohort. Half of all IPSI patients were at their home address at time of injury. There was no significant association between where the injury occurred (home or away) and the severity of the injury.

Injury characteristics

In total, 39 (28.5%) IPSI admissions met the criteria for major trauma (ISS >15), with no statistically significant difference between men and women. Using the Mann–Whitney U test, no statistically significant difference was found between the median ages of patients with major (39) versus minor (32) injuries (p=0.64). There was no mortality among minor injury IPSI patients; however, seven patients with major IPSI died, indicating 5% of the total population and 18% of the major trauma population. The predominant mode of injury was either falls from height with 19 cases (49%) for major trauma or lacerations/stabs with 73 cases (75%) for minor trauma. There was no statistically significant difference in the injury severity between patients who were injured at home versus those who were not. There was a statistically significant association between the mechanism of injury and its severity as those with laceration/stab type injuries were less likely to have major trauma, comprising only 6% (n=8) of the whole population group. There was no significant difference in the injury severity between the primary parts injured. Head and neck injuries were the most common, followed closely by extremity (limbs) and abdominal/pelvic injuries.

Outcomes and management

Operative management during inpatient admission was pursued in 92 (67%) cases, with a complication rate of 24%. These are outlined in Table 3.

Utilising the Mann–Whitney U test, the median ISS of patients with operative management of 7 (IQR 1–22) was significantly higher than the ISS of patients with non-operative management (NOM) of 2 (IQR 1–11.5) with p=0.02. The same was found when comparing median ISS across patients with no post-operative complications—4 (IQR 1–10)—and those with complications—27 (IQR 22–38). Patients with injuries to extremities (n=73, i.e., 53%) were most likely to receive operative management, followed by those with abdominal and head and neck injuries.

Sixty-four patients (47%) were discharged home without assistance, with a significant difference when compared across major and minor injury as only 11 (28%) of the major IPSI cohort could be discharged home compared to 53 (54%) of the minor IPSI cohort. Those who were not discharged home without assistance either went to other tertiary, rehabilitation or residential

Table 2: Descriptive analysis of injury patterns and outcomes for IPSI patients admitted to the Auckland City Hospital Trauma Service 2015–2019.

	n Minor (ISS ≤15) *		n Major (ISS >15) *	
Location of occurrence—no difference				
Home	53	39%	15	11%
Away	45	33%	24	18%
χ^2 2.7228; p-value .098922				
Sex distribution—no difference				
Female	28	20%	10	20%
Male	70	51%	29	51%
χ^2 0.1195; p-value .729554.				
Mechanism (expanded)				
Fall	9	7%	19	14%
Laceration/stab	73	53%	8	6%
Pedestrian	5	4%	3	2%
MVA	7	5%	2	1%
Other	2	1%	9	7%
χ^2 40.8421; p-value <0.01.				
Mechanism (contracted)				
Fall	9	7%	19	14%
Lacerations/stab	73	53%	8	6%
Other	16	12%	12	9%
χ^2 37.9291; p-value <0.01				
Management				
Operative	60	44%	32	23%
Non-operative	38	28%	7	5%
χ^2 5.486; p-value .02				
Discharge				
Home, no assistance	53	39%	11	8%
Other	45	33%	28	20%
χ^2 7.5045; p-value 0.01				

Table 2 (continued): Descriptive analysis of injury patterns and outcomes for IPSI patients admitted to the Auckland City Hospital Trauma Service 2015–2019.

Case fatality				
Alive	98	72%	32	23%
Dead	0	0%	7	5%
Fisher’s exact test and p-value <0.01				
Primary part injured, grouped by management				
	n Operative *		n Non-operative *	
Head and neck	29	21%	17	12%
Extremity	31	23%	4	3%
Other	3	2%	10	7%
Chest	6	4%	7	5%
Abdomen	23	17%	7	5%
χ^2 22.9109; p-value <0.01				

* Raw number | percentage of whole population.

Figure 1: Mechanism of injury vs primary part injured for IPSI patients admitted to the Auckland City Hospital Trauma Service 2015–2019.

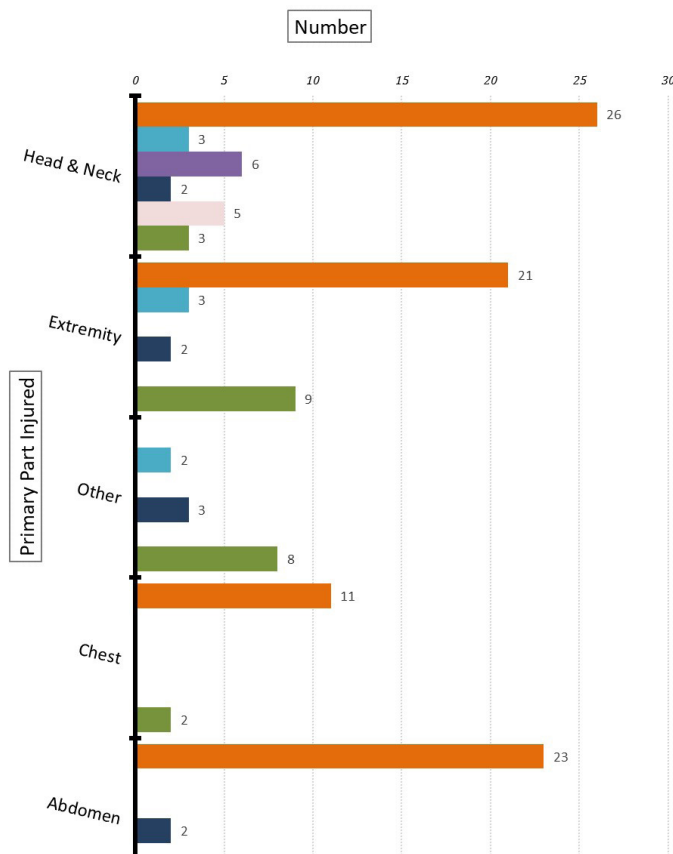
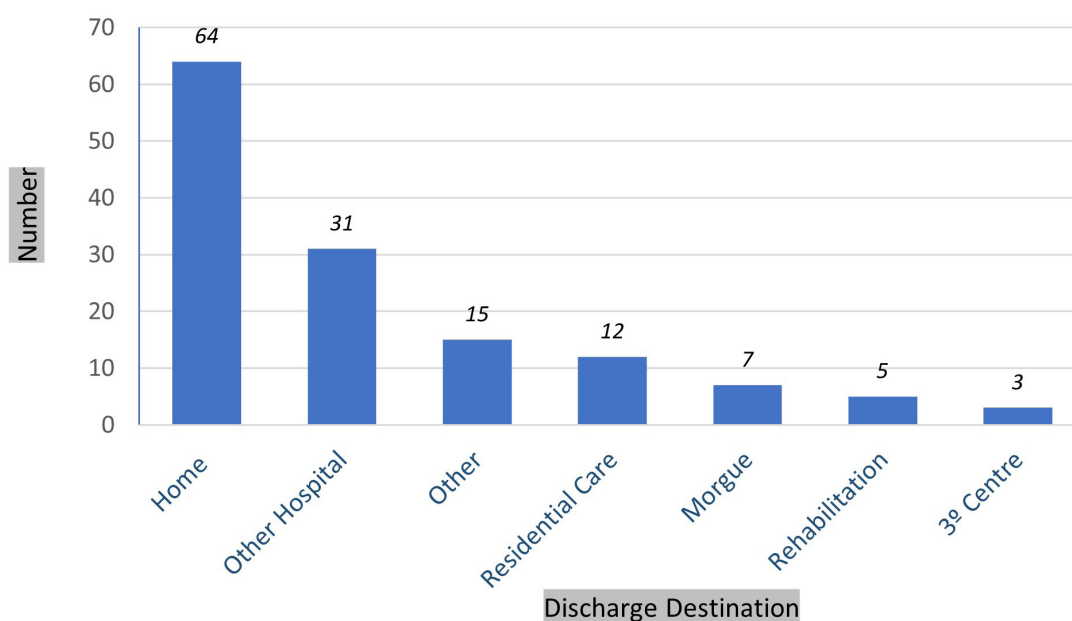


Table 3: Post-operative complications for IPSI patients.

Complication		Number
Cardiopulmonary	Aspiration	1
	Pneumothorax	1
	Pulmonary embolus	1
	Arrythmia	1
	Myocardial infarction	1
Infection	Empyema	2
	Meningitis	1
	Pneumonia	2
	Urinary	1
	Other Infection	1
Other	Death	4
	Pressure sore	1
	Other, not listed	5

Figure 2: Discharge destination for IPSI patients admitted to Auckland City Hospital 2015–2019.



facilities (including psychiatric care), or required such facilities to be provided in the community/home setting.

Using the Mann–Whitney U test, the median LOS was identical at 3 days for both operative and non-operative groups, with an IQR of 1–7.75 and 2–14 days, respectively ($p=0.17$). However, when comparing injury severity, the LOS was different: 5 days (IQR 2–11) for major injuries versus 3 days (IQR 1–7.25) for minor injuries ($p=0.03$).

Discussion

This study is a novel inquiry into IPSI within Auckland, revealing valuable insights that have the potential to impact surgical practice, enhance injury prevention and improve patient management.

Operative management was a likely outcome (67%) for IPSI patients, underscoring a pivotal aspect of treating patients with self-inflicted injuries—namely, the propensity for these cases to frequently require surgery. There is a paucity of evidence regarding the likelihood of surgical interventions for trauma admissions within an inpatient period; however, some estimates suggest that this may range from upwards of 30 to 45 per cent.^{21,22} Extremity injuries were more likely to require operative management than abdominal or head and neck injuries. This is in line with NOM of abdominal and neck injuries being increasingly favoured over mandatory surgical exploration, with growing acceptance and success rates in selected cases.^{23,24} Radiological adjuncts such as angiography and percutaneous drainage are noted to enhance the success rates of NOM, though risks of missed injuries and delayed haemorrhage remain considerations.²³ This also highlights the vital role comprehensive understanding of injury characteristics plays in anticipating operative management in IPSI cases. Detailed analysis of injury anatomy and severity becomes instrumental in devising personalised, effective treatment plans.

IPSI patients in this study also had relatively high post-operative complication rates (of 24%). When compared across international trauma data, estimates suggest that post-operative complication rates for trauma patients range from as low as 2.8% in some centres to around 12.5% in others.^{25–27} Those with post-operative complications generally had a higher ISS than those who did not, which is generally in line with previously reported associations.²⁷ However, the

presence of concomitant IPSI may compound this effect and aid in risk stratification.²⁸ Surgeons can use this information to better counsel patients regarding their risk profile for surgery, setting realistic expectations about potential outcomes and complications.

There was an evident relationship between the nature of injury and its severity, with falls from height predominantly accounting for major injuries and lacerations/stabbings defining minor injuries. However, this likely depends on the height from which one has fallen and the depth of injury from lacerations or penetrating wounds. Nevertheless, the association is in line with established injury patterns for physical self-injury, as jumping from height is a known precipitant for polytrauma and severe injury especially in the context of clear suicidal intent.²⁹ Self-inflicted stab or laceration wounds also seem a consistent feature in self-harm presentations internationally; however, research in this area does skew heavily towards Western countries.^{13,30}

These associations indicate a complex relationship between the nature of an injury and its potential impact on the individual in the context of IPSI. It underscores the necessity for bespoke preventive measures and mental health interventions designed to mitigate the incidence of IPSI. Recognising injury patterns that are more likely to cause major trauma can enable front-line clinicians to anticipate and promptly address these, potentially reducing the time to treatment and improving outcomes. From a public health perspective, it necessitates the inclusion of preventative strategies such as infrastructure modifications and responsible media coverage. Such means-restriction strategies have been outlined previously by the World Health Organization and proven successful in New Zealand—as seen with the reintroduction of barriers on Auckland's Grafton Bridge.^{31,32} However, despite recognising their importance, policies for preventing falls or jumps from height remain absent in New Zealand's suicide prevention strategies.³³

Interestingly, the case fatality rate reported in this study for major trauma (18%) was higher than that reported for all major trauma in Auckland (12.5%) and New Zealand (8.4%).^{6,34} The selection of 2019 as a baseline for comparison was based on its relevance as the most recent year of data available at the time of analysis. The mortality rate for self-inflicted injuries in trauma populations varies significantly; however, self-inflicted injury is consistently demonstrated as an independent

risk factor for increased mortality compared to non-intentional injuries.^{35,36} Such findings draw attention to the heightened vulnerability of IPSI patients and highlight the severe implications of self-inflicted injuries on patient outcomes and healthcare systems. Identifying populations with higher mortality rates guides healthcare policy and resource allocation, and understanding that IPSI carries a higher risk of fatality supports the inclusion of prevention measures into the broader public health agenda.

Of the patients who survived, most could not be discharged directly home, indicating increased reliance on alternative care or rehabilitation facilities. This was further compounded by injury severity, with major trauma IPSI having an even lesser discharge-to-home rate. The presence of IPSI may indicate a more pronounced need for healthcare resources across rehabilitation services, including physical therapy, occupational therapy and psychological support. Multidisciplinary input should be instated at the early stages of trauma care to mitigate the challenge of discharge planning for IPSI patients. This post-hospitalisation trajectory also illuminates the necessity for robust support systems, prolonged post-discharge care and the establishment of long-term rehabilitation services.

There exists a wealth of evidence signifying previous self-harm as an independent risk factor for readmission for psychological distress, indicating significant mental health service use to be anticipated post-discharge.³⁷ However, data on the broader resource requirements for IPSI patients in the trauma setting are limited, especially concerning the need for integrated services. Some estimates suggest that as few as 6% of older patients (65+ years old) with self-inflicted injuries could be discharged directly home.³⁸ These considerations hold substantial implications for healthcare systems as discharge to a non-home setting often involves coordination with community and social services to ensure that patients have the necessary support upon leaving the hospital. It may be argued that IPSI patients have complex needs that extend beyond immediate mental health services and that the trajectory of recovery for these patients might include long-term rehabilitation, which can be intensive and multifaceted.

When considering the mental health needs in New Zealand, it is essential that a multisystem approach—encompassing primary prevention, public health strategies and mental health

services—are cost effective and given due priority. This highlights the need for multidisciplinary trauma teams to acknowledge and integrate the often overlooked burden of mental health into their patient care protocols. Operative management must adhere to principles of acute trauma care but also consider the burden of psychosocial distress. Along with their peers, surgeons must navigate the complex ethical, psychological and medical considerations associated with self-harm, including assessing the patient's capacity to consent to treatment, understanding the underlying causes of self-harm and coordinating with mental health professionals to address both immediate and long-term needs.⁸

Several obstacles exist to the provision of adequate healthcare for mental health patients across both psychosocial and medical systems. Patients who self-harm, and healthcare workers who try to help, are often met with barriers ranging from stigmatisation to bureaucracy—such as fragmented service delivery.^{39,40} Many clinicians, especially early career professionals, may experience negative attitudes towards mental health service users, which can impede the provision of compassionate and effective care.^{41,42} It is suggested that such attitudes likely stem from a combination of lack of training, personal biases and systemic issues within healthcare education and policy.^{41,42}

Finally, exploring the impact of IPSI from the Māori perspective is the next logical step of this research. Future work in this field should be conducted with Kaupapa Māori research-based principles. The results of this would warrant its own, separate study, in partnership with (if not solely by) Māori research experts. The interpretation of Māori data requires the expertise of kaitiaki and access to cultural resources, which are crucial in suicide prevention strategies. Currently, official data indicate that Māori are at an increased risk of suicide compared to non-Māori populations in New Zealand.⁴³ However, a conflicting viewpoint is represented when focussing on the university population, which suggests that Māori are at less risk of self-harm than other ethnicities.⁴⁴ The unexpected result might indicate variances in reporting and the cultural differences in university and non-university Māori groups, into which the effects of historic colonisation and marginalisation play an important role. It is crucial that research involving Māori data must be done and authorised by Māori in its application to enhance the cultural validity of the research.⁴⁵

The viewpoint of the current study is to be a precursor to more nuanced discussions regarding IPSI in the New Zealand demographic—the first step. Further research should explore these aspects in depth, ensuring a holistic understanding of the underlying factors and how these may be influenced.

Limitations

This study, through its single-centre design and relatively small cohort size, is constrained in the wider applicability of its findings. The absence of preceding research in New Zealand presents a challenge in providing context to our findings; however, it must be emphasised that the purpose of the study was exploratory and hypothesis generating, rather than hypothesis testing. Comparisons were only made to ACH registry data from 2019, and a comprehensive analysis of the full 5-year dataset may offer more extensive insights but could also introduce complexity. Moreover, this study, being retrospective in nature and predating the COVID-19 era, is ill-equipped to consider the far-reaching impact of the pandemic on mental health globally. It does not account for the pandemic's psychosocial impact, which may have influenced the incidence and nature of IPSI. The study is reliant upon accurately coded medical records and potential variations in the human input of this data may have introduced information bias. Finally, the lack of access to mental health records restricted a more comprehensive interpretation of data. Psychiatric histories may provide insights into the motivations and risk factors associated with IPSI, allowing an exam-

ination of the correlation between psychiatric conditions and the methods or severity of IPSI.

Conclusion

This single-centre cross-sectional study conducted at Te Toka Tumai Auckland – ACH from 2015 to 2019 provides insight into the epidemiology, injury patterns and outcomes of IPSI in Auckland, New Zealand. Our findings draw attention to the unique characteristics and needs of IPSI patients within the trauma population, signifying the necessity for specialised consideration from surgeons, healthcare systems and public health initiatives. It brings to light a noteworthy proportion requiring operative management and the variation in injury patterns. The disparities in injury outcomes, particularly the higher case fatality rate observed in patients with major trauma compared to national averages, call for a concerted effort to improve preventative measures and healthcare responses to self-inflicted injuries. The observed reliance on post-hospitalisation resources, especially for patients with severe injuries, highlights the necessity for integrated care pathways that encompass not only acute medical treatment but also long-term rehabilitation and mental health support. The study offers an initial overview of IPSI within New Zealand and flags the importance of further examination into the factors contributing to these injuries. It is vital that future research explores the societal and cultural aspects of IPSI, with methodology that honours prevention and with intervention strategies that are both culturally sensitive and effective.

COMPETING INTERESTS

The authors have no competing interests to declare.

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