

Ethnic variation in hospitalisation due to treatment injury and complications of healthcare in older adults residing in New Zealand

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ABSTRACT

AIM: To describe the incidence, characteristics, and ethnic variation of hospitalisations for treatment injury and complications of medical or surgical care in older adults in two regions of Aotearoa New Zealand.

METHODS: This observational study analysed treatment-related hospital admissions (>24 hours; index injury from primary or secondary care) among older adults (>50 years) between 2014–2018 in Lakes and Bay of Plenty District Health Boards. Among all admissions due to a treatment injury (n=296) or a complication of healthcare (n=13,850), age-standardised incidence rates per 100,000 were determined by ethnicity and age group.

RESULTS: The rates of admissions for treatment injuries were 30% lower among non-Māori than among Māori (New Zealand's Indigenous population). Complications of healthcare admissions rates were 43% lower among non-Māori than in Māori. Medications were the most common cause (54%) of healthcare complications. Rates of treatment injury and healthcare complications increased with age for both Māori and non-Māori, until the age of 80 years.

CONCLUSION: Ethnic variation in treatment injuries and complications of healthcare between Māori and non-Māori provide further evidence of the existence of inequities in access to quality healthcare in New Zealand. Transparent, publicly available national monitoring of treatment injuries and complications, disaggregated by age and ethnicity, is recommended.

Despite efforts to optimise patient safety, the occurrence of treatment injuries and adverse events in healthcare are inevitable.^{1–3} Aotearoa New Zealand has a national no-fault injury compensation scheme (the Accident Compensation Corporation [ACC]) that covers treatment injuries. ACC define treatment injury as an injury that is suffered by an individual during treatment from a health professional, in which the injury is not a necessary component or expected outcome of the medical care given.⁴ This encompasses terms such as medical misadventure, medical mishap, patient safety incident, medical injury, and medical error that have led to the unintentional injury of a patient.^{5,6} Treatment injury and other adverse events resulting from healthcare contribute to morbidity, mortality, hospitalisations, and workload in healthcare systems worldwide.³

A significant proportion of claims are related to treatment injuries, with a higher incidence of these among older populations.⁷ There is a paucity of contemporary literature focusing on the rates

and characteristics of hospital admissions due to treatment injury in New Zealand, particularly in older adults of different ethnic groups. The most extensive nationwide data analysis of adverse events in healthcare in New Zealand by Davis et al. demonstrated that up to 13% of hospital admissions were due to adverse events in healthcare treatment, with over one third deemed preventable.^{1,8} Māori (New Zealand's Indigenous population) and older adults are over-represented in adverse events in New Zealand.^{1,5,8–13} Ethnic disparities in the quality of healthcare in New Zealand are evident across multiple specialties and outcome measures.^{9,12,14–16}

Discrepancies in treatment injuries between age and ethnic groups could suggest a lack of culturally safe care and the inequitable provision of quality healthcare.^{12,14,16,17} Adequate reporting on the rates and characteristics of treatment injuries and the profile of patients experiencing these is essential to inform the provision of quality care provided by health professionals, and to guide potential strategies for mitigating the risks of healthcare treatment.

The aim of this study was to describe the incidence, characteristics, and ethnic variation of hospitalisations for treatment injury and complications of medical or surgical care in older adults in a region of New Zealand with a high proportion of Māori residents.

Method

This observational study was conducted as part of a larger research project involving an iwi-led, community-based injury prevention intervention for older Māori adults within Te Arawa rohe (tribal area), which spans Lakes and Bay of Plenty (BoP) District Health Boards (DHBs).¹⁸

Treatment-related hospital admissions (>24 hours; index treatment-related injury may have occurred in primary or secondary care) were examined among people aged 50 years and older, residing in and admitted to either of the two DHBs for the 5-year period from 2014–2018. Analysis used the Manatū Hauora – Ministry of Health’s National Minimum Dataset (NMDS), which includes all New Zealand public inpatient hospital admissions. ACC use International Classification of Disease (ICD-10) codes to classify treatment injury by mapping these ICD-10 codes to read codes (coding system used in New Zealand primary care). ICD-10 codes were used in this study to identify treatment injury and complications of medical and surgical care (noting that the majority of complications of healthcare are not classified as treatment injuries by ACC). All records where the primary external cause code related to a medical or surgical care related injury (ICD codes Y40–Y84) were included. Cases of “treatment injury” and “complications of medical and surgical care” (Table 1) were described and analysed separately.

Variables of interest included patient demographics (age, gender, ethnicity, DHB location, New Zealand Deprivation Index) and admission characteristics (length of stay and primary cause of admission). Ethnicity was categorised as Māori or non-Māori based on self-identified ethnicity captured in the NMDS.¹⁹ For records with multiple ethnicities, records were allocated to just one ethnic category using the prioritised ethnicity method, where Māori is the highest priority and European is the lowest.²⁰ This method is currently the New Zealand Ministry of Health’s recommendation for managing analysis by ethnicity, and puts a focus on the Māori population.²¹ NZDep2018, an area-level

deprivation measure, was used to quantify socioeconomic deprivation status.²²

Descriptive analyses presented include counts, percentages, rates per 100,000 and 95% confidence intervals for Māori and non-Māori, and overall. Chi-squared tests were used to compare demographic characteristics in Māori and non-Māori. Denominator data from the 2018 census came from Statistics New Zealand.²³ In 2018, there were 131,628 people aged 50 or older living in Lakes or BoP DHB, of whom 17.8% identified as Māori. Denominators for non-Māori were calculated as the difference between the total number of usual residents and the Māori usual resident population, so individuals identifying as both Māori and another ethnicity were only counted as Māori (i.e., prioritised, as for the numerator). For the calculation of age-standardised incidence rates, the Māori 2001 census population was used. This more accurately reflects the age structure of the Māori population in New Zealand compared to the World Health Organization’s standard reference population, and enables a comparison of rates between ethnic groups while centring Māori in the analysis.^{24–27} The use of data from the 2001 census aligns with Manatū Hauora – Ministry of Health recommendations, and notes that the age structure did not change significantly between 2001–2016.²⁴ In this document it is discussed that the 2018 census would provide an opportunity to review again whether it is still relevant to use 2001 data for standardisation. However, on expert review by a Statistics New Zealand-convened panel (Census External Data Quality panel 2018), the severe under-reporting for Māori was noted as a moderate-high risk for affecting the ability to interpret data in a meaningful way.²⁵ These aspects all informed the expert opinion and team decision on the use of 2001 census data for standardisation.

Hospitalisation Rate Ratios (RRs) comparing rates among non-Māori with Māori were calculated using Poisson regression, with population denominators as an offset, and adjustment for age, gender, and DHB. To evaluate group differences in rates of treatment injuries between non-Māori and Māori, an interaction term was tested between ethnicity and each of age group, gender, and DHB. Excel (Microsoft Excel, version 16.65) and Stata (StataCorp, version 17) were used for analyses. A p-value <0.05 was considered statistically significant, with no adjustments being made for comparisons that focus on admission characteristics.

Table 1: ICD-10 external cause codes used to identify eligible cases.

Treatment injury cases (ICD-10 codes Y60–Y69)	
ICD10 code group	Definition
Y60–Y69	<i>Misadventures to patients during surgical and medical care</i>
Y60	Unintentional cut, puncture, perforation, or haemorrhage during surgical and medical care
Y61	Foreign object accidentally left in body during surgical and medical care
Y62	Failure of sterile precautions during surgical and medical care
Y64	Contaminated medical or biological substances
Y65	Other misadventures during surgical and medical care
Y66	Non-administration of surgical and medical care
Y69	Unspecified misadventure during surgical and medical care
Complications of medical and surgical care cases (ICD codes Y40–Y84, excluding Y60–Y69)	
Y40–Y84	<i>Complications of medical and surgical care</i>
Y40–Y59	Drugs, medicaments, and biological substances causing adverse effects in therapeutic use
Y70–Y82	Medical devices associated with adverse incidents in diagnostic and therapeutic use
Y83	Surgical operation and other surgical procedures as the cause of abnormal reaction of the patient, or of later complication without misadventure at the time of the procedure
Y84	Other medical procedures as the cause of abnormal reaction of the patient or of later complication, without mention of misadventure at the time of the procedure

Table 2: Demographic characteristics and incidence of treatment injury-related hospitalisations¹ in people aged 50 or older residing in Lakes and Bay of Plenty District Health Boards (2014–2018) (n=296).

	Demographic characteristics (column %)			Age-standardised rate per 100,000 people [†] (95%CI)		Adjusted RR ³ for non-Māori compared to Māori (95%CI)
	Total N=296	Māori N=53	Non-Māori N=243	Māori N=53	Non-Māori N=243	p-value
Number of admissions	296	53	243	46.6 (33.9, 59.3)	35.5 (30.1, 40.9)	0.70 (0.51, 0.95) p=0.02
Gender						
Female	137 (46.3%)	25 (47.2%)	112 (46.1%)	41.3 (24.9, 57.8)	29.8 (23.1, 36.5)	0.68 (0.43, 1.07) p=0.09
Male	159 (53.7%)	28 (52.8%)	131 (53.9%)	52.5 (32.9, 72.1)	41.7 (33.2, 50.2)	0.72 (0.47, 1.10) p=0.13
Age (in years)						
50–59	67 (22.6%)	19 (35.8%)	48 (19.8%)	34.9 (19, 50.7)	27.7 (19.7, 35.7)	0.80 (0.47, 1.37) p=0.42
60–69	79 (26.7%)	19 (35.8%)	60 (24.7%)	53.5 (29.4, 77.5)	34.1 (25.4, 42.9)	0.63 (0.37, 1.05) p=0.08
70–79	89 (30.1%)	13 (24.5%)	76 (31.3%)	82.2 (37.4, 127.0)	57.7 (44.6, 70.8)	0.66 (0.37, 1.20) p=0.17

Table 2 (continued): Demographic characteristics and incidence of treatment injury-related hospitalisations¹ in people aged 50 or older residing in Lakes and Bay of Plenty District Health Boards (2014–2018) (n=296).

	Demographic characteristics (column %)			Age-standardised rate per 100,000 people [†] (95%CI)		Adjusted RR ³ for non-Māori compared to Māori (95%CI)
Age (in years)						
80+	61 (20.6%)	+	59 (24.3%)	35.5 (0.0, 84.6)	92.3 (68.1, 116.4)	0.65 (0.15, 2.82) p=0.57
District health board						
Bay of Plenty	198 (66.9%)	31 (58.5%)	167 (68.7%)	45.0 (29.0, 60.1)	32.8 (26.8, 38.9)	0.67 (0.45, 1.00) p=0.05
Lakes	98 (33.1%)	22 (41.5%)	76 (31.3%)	49.5 (28.6, 70.4)	42.5 (31.4, 53.5)	0.72 (0.44, 1.18) p=0.19

1 Including hospitalisations where the primary external cause code was an ICD-10 code Y60–Y69.

2 Age-standardised to Māori 2001 census population.

3 Hospitalisation Rate Ratio (RR) has been calculated using Poisson regression, with population denominators as an offset and adjusted for age, gender, and DHB.

Table 3: Admission characteristics of treatment injury-related hospitalisations in Lakes/Bay of Plenty District Health Boards (2014–2018)—column % (n=296).

Variable	Total	Māori	Non-Māori
Number of admissions	296	53	243
Nature of complication (primary external cause code)			
<i>Unintentional event in surgical operation*</i>	197 (66.6%)	31 (58.5%)	166 (68.3%)
<i>Foreign object left in body during surgical or medical care</i>	6 (2.0%)	+	6 (2.5%)
<i>Blood or fluid transfusion error</i>	4 (1.4%)	+	3 (1.2%)
<i>Other specified misadventure during surgical/ medical care</i>	84 (28.3%)	19 (38.5%)	65 (26.7%)
<i>Unspecified misadventure in surgical/ medical care</i>	5 (1.7%)	+	3 (1.2%)
Length of stay			
1 day	30 (10.1%)	3 (5.7%)	27 (11.1%)
2–3 days	50 (16.9%)	11 (20.8%)	39 (16.0%)
4–10 days	116 (39.2%)	22 (41.5%)	94 (38.7%)
11–20 days	70 (23.6%)	10 (18.9%)	60 (24.7%)
21+ days	30 (10.1%)	7 (13.2%)	23 (9.5%)

*Unintentional event in surgical operation = unintentional cut, puncture, haemorrhage, or perforation.

+ n<=3, data suppressed.

Table 4: Demographic characteristics and incidence of hospitalisations involving a complication of medical and surgical care¹ in people aged 50 or older residing in Lakes and Bay of Plenty District Health Boards (2014–2018) (n=13,850).

	Demographic characteristics (column %)			Age-standardised rate per 100,000 people ² (95%CI)		Adjusted RR ³ for non-Māori compared to Māori (95%CI)
	Total N=13,850	Māori N=2,991	Non-Māori N=10,859	Māori N=2,991	Non-Māori N=10,859	p-value
Number of admissions	13,850	2,991	10,859	2,485.3 (2,401.3, 2,569.3)	1,311.6 (1,282.1, 1,341.2)	0.57 (0.54, 0.59) p<0.001
Gender						
Female	6,621 (47.8%)	1,490 (49.8%)	5,131 (47.3%)	2,284.9 (2,174.0, 2,395.7)	1,170.0 (1,130.8, 1,209.3)	0.56 (0.53, 0.60) p<0.001
Male	7,229 (52.2%)	1,501 (50.2%)	5,728 (52.7%)	2,727.5 (2,599.5, 2,855.6)	1,470.9 (1,426.5, 1,515.4)	0.57 (0.54, 0.61) p<0.001
Age (in years)						
50–59	2,273 (16.4%)	908 (30.4%)	1,365 (12.6%)	1,636.5 (1,533.2, 1,739.8)	763.7 (723.1, 804.2)	0.48 (0.44, 0.53) p<0.001
60–69	3,448 (24.9%)	990 (33.1%)	2,458 (22.6%)	2,751.3 (2,592.2, 2,910.4)	1,409.3 (1,354.9, 1,463.7)	0.54 (0.50, 0.58) p<0.001
70–79	4,010 (29.0%)	752 (25.1%)	3,258 (30.0%)	4,581.6 (4,292.5, 4,870.8)	2,419.4 (2,340.4, 2,498.3)	0.54 (0.50, 0.59) p<0.001

Table 4 (continued): Demographic characteristics and incidence of hospitalisations involving a complication of medical and surgical care¹ in people aged 50 or older residing in Lakes and Bay of Plenty District Health Boards (2014–2018) (n=13,850).

	Demographic characteristics (column %)			Age-standardised rate per 100,000 people ² (95%CI)		Adjusted RR ³ for non-Māori compared to Māori (95%CI)
Age (in years)						
80+	4,119 (29.7%)	341 (11.4%)	3,778 (34.8%)	5,860.9 (5,337.4, 6,384.3)	5,209.8 (5,060.7, 5,359)	0.92 (0.83, 1.03) p=0.16
District health board						
Bay of Plenty	9,322 (67.3%)	1,807 (60.4%)	7,515 (69.2%)	2,411.8 (2,306.6, 2,517.1)	1,203.2 (1,169.9, 1,236.5)	0.52 (0.50, 0.55) p<0.001
Lakes	4,528 (32.7%)	1,184 (39.6%)	3,344 (30.8%)	2,595.7 (2,457.2, 2,734.3)	1,601.8 (1,540.1, 1,663.4)	0.65 (0.61, 0.69) p<0.001

¹ Including hospitalisations where the primary external cause code was an ICD-10 code Y40–Y84, excluding treatment injuries (Y60–Y69).

² Age-standardised to Māori 2001 census population.

³ Hospitalisation Rate Ratio (RR) has been calculated using Poisson regression, with population denominators as an offset and adjusted for age, gender, and DHB.

Table 5: Characteristics of complications of medical and surgical care-related hospitalisations in Lakes/Bay of Plenty District Health Boards (2014–2018)—column % (n=13,850).

Variable	Total	Māori	Non-Māori
Number of admissions	13,850	2,991	10,859
Nature of complication (primary external cause code)			
Medication related (Y40–Y59)	7,479 (54.0%)	1,679 (56.1%)	5,800 (53.4%)
Medical devices associated with adverse incident (Y70–Y82)	58 (0.4%)	13 (0.4%)	45 (0.4%)
Surgical operation with later* complication/ reaction (Y83)	4,142 (29.3%)	742 (24.8%)	3,400 (31.3%)
Medical procedures with later* complication/ reaction (Y84)	2,171 (15.7%)	557 (18.6%)	1,614 (14.9%)
Length of stay			
1 day	2,599 (18.8%)	514 (17.2%)	2,058 (19.2%)
2–3 days	3,672 (26.5%)	826 (27.6%)	2,846 (26.2%)
4–10 days	5,317 (38.4%)	1,201 (40.2%)	4,116 (37.9%)
11+ days	1,582 (11.4%)	325 (10.9%)	1,257 (11.6%)
21+ days	680 (4.9%)	125 (4.2%)	555 (5.1%)

*Later = abnormal reaction or complication occurring after the operation/procedure, without mention of misadventure at the time of the procedure.

Ethics approval for the parent study was obtained from the Auckland Health Research Ethics Committee (Reference: AH22920).

All data was deidentified and stored in password protected files.

Results

During the five-year period reviewed, there were 28,123 injury-related acute admissions to hospitals in the Lakes or BoP DHB among people that were residents of these DHBs and aged 50 years and older. Of these, 296 cases had admissions that were related to a treatment injury (Y60–Y69) and a further 13,850 cases were admitted for complications of medical and surgical care (Y40–Y84).

Treatment injuries

Demographic characteristics

Of the 296 treatment injury cases, males accounted for over half (53.7%), and the median age was 70 years old. People identifying as NZ European (NZE) or European Other made up 79.1% of treatment injury hospitalisations over the period reviewed, followed by Māori (17.9%), Asian (2%), and Pacific People (1.0%). Māori were typically younger than their non-Māori counterparts ($p=0.001$), with 71.6% of Māori patients aged between 50–69 years compared with only 44.5% of non-Māori (Table 2). Māori patients admitted for treatment injury hospitalisations had high rates of deprivation, with over two thirds ($n=37/53$; 69.8%) residing in the most deprived quintile. A significantly lower proportion (24.3% [$n=59/243$]) of non-Māori patients were in the fifth quintile ($p<0.001$).

The rate of admission for treatment injuries was 30% (95% CI 5% to 49%) lower among non-Māori than among Māori (adjusted for gender, age group, and DHB) (Table 2) ($p=0.02$). There were no statistically significant interactions between ethnicity and gender ($p=0.87$), age group ($p=0.92$), or DHB ($p=0.77$) within the relatively small numbers of this dataset.

Admission characteristics

An “unintentional cut, puncture, perforation, or haemorrhage during surgical and medical care” was the most common nature of the complication for patients in the treatment injury group, accounting for 66.6% ($n=197/296$) of events (58.5% for Māori compared to 68.3% for non-Māori). Admissions as a result of “other specified misadventure

during surgical or medical care” accounted for the majority of the remaining treatment injury cases (28.0%), with no further details of the type of misadventure available in the extracted data.

More than two thirds ($n=216/296$; 72.9%) of admissions due to treatment injury resulted in a length of hospital stay of 4 or more days. The median stay for both Māori and non-Māori was 7 days, with a mean of 10.3 days for Māori and 10.5 days for non-Māori.

Complications of medical and surgical care

Demographic characteristics

Of the 13,850 cases related to “other complications of medical and surgical care”, males accounted for 52.7% ($n=7,229/13,850$) and the median age of all cases was 73 years old (Table 4). People identifying as NZ European or European Other made up 76.0% of hospitalisations that were due to complications of healthcare, followed by Māori (21.6%), Pacific Islander (1.4%), Asian (0.4%), Indian (0.5%) and African (0.1%).

Māori patients with complications of healthcare were younger than non-Māori patients ($p<0.001$), with 63.5% ($n=1,898/2,991$) of Māori cases aged between 50–69 years compared with only 35.2% ($n=3,823/10,859$) of non-Māori cases in the same age group (Table 4). Māori hospitalisations due to a complication of healthcare were disproportionately represented by patients with a higher index of deprivation, with 62.7% ($n=1,876/2,991$) of Māori being in the most deprived area (quintile 5) compared with only 28.4% ($n=2,085/10,859$) of non-Māori ($p<0.001$).

The rate of admission for injuries related to a complication of medical and surgical care was 43% lower (95% CI 41% to 46% lower) in non-Māori than in Māori (adjusted for gender, age group, and DHB in Table 4) ($p<0.001$). There was no statistically significant interaction between ethnicity and gender ($p=0.17$), indicating that the difference between males and females did not vary by ethnicity. However, there were significant interactions between ethnicity and age group ($p<0.001$) and DHB ($p<0.001$), indicating that the difference between non-Māori and Māori did vary significantly by these two variables. Ethnic differences in rates were present in those aged under 80 ($p<0.001$); however, for those aged over 80, there was not a significant difference in hospitalisation rates for complications of care between non-Māori and Māori ($p=0.16$) (Table 4).

There was a significantly higher hospitalisation rate for non-Māori in Lakes DHB compared to non-Māori in BoP ($p < 0.001$), but no significant difference in rates between these two areas for Māori ($p = 0.141$).

Admission characteristics

Māori and non-Māori hospitalisations relating to a complication of medical or surgical care demonstrated similar trends in the following characteristics of their admissions. The most common nature of the complication was related to medications and “the adverse effects of their therapeutic use”, accounting for 54.0% of these hospitalisations ($n = 7,479/13,850$) (Table 5). This was followed by complications in surgical operations ($n = 4,124/13,850$, 29.3%). Of the total number of hospitalisations related to a complication of healthcare, 83.7% of these had a length of stay in hospital of 10 days or less, with the median length of stay being 4 days for both Māori and non-Māori groups.

Discussion

This analysis of treatment-related hospital admissions among older adults in the Lakes and BoP DHBs has demonstrated significant ethnic differences, with non-Māori admission rates for both treatment injuries and complications of care being significantly lower than Māori rates. A greater proportion of Māori patients were from areas of higher deprivation compared to non-Māori for admissions related to both treatment injury and complications. Over half of all admissions due to a complication of medical or surgical care were medication related, followed by complications in surgical operations. Rates of admission for treatment injury and complications increased with age for both Māori and non-Māori, until the age of 80 years.

Ethnic disparities in the rates of admission due to treatment injury and complications of care evident in this study suggest inequities in the quality of healthcare for different ethnic groups in New Zealand. The recent study by Reid et al. showed that there are lower rates of primary care utilisation among Māori than non-Māori, revealing a \$49 million annual government funding underspend associated with this ethnic gap.²⁸ Although Māori aged over 65 years in the Reid study were more likely to utilise primary care than non-Māori, they had higher rates of hospitalisations that were deemed potentially preventable through primary care interventions

(ambulatory sensitive hospitalisations).²⁸ This suggests that older Māori health needs are not met by the availability and quality of primary care provided, which is consistent with the findings from the current study.

There is a strong body of literature demonstrating that Māori have greater barriers to accessing healthcare, have poorer health outcomes, and are more likely to have poorer experiences of care than non-Māori.^{12,14,16} Evidence specific to the quality of healthcare for Māori is less extensive, particularly in the context of treatment injury. Although Māori were more likely than non-Māori to be hospitalised due to treatment-related care in our study, ACC information requested under the Official Information Act showed that Māori were less likely to have accepted ACC claims for treatment injuries.²⁹ The standardised accepted treatment injury claim rates per 10,000 population was 22.1 for Māori, 34.0 for Pacific, 10.0 for Asian and 34.6 for “Other”. This data was for the same age groups, time period, and two regions as our study data, and suggests that there are likely inequities in access to ACC resourcing for treatment injuries for Māori. In a review of unplanned re-admission or deaths within a 30-day period following a defined set of inpatient surgical procedures, Rumball-Smith et al. found that Māori had 16% higher odds of an event compared to NZ Europeans.¹⁵ Significant ethnic differences in rates of treatment injuries and complications of care identified in the current study align with the minimal existing literature; however, there is a need for further research in this area at a national scale. Adequate reporting of this data, and any disparities in rates by ethnicity, is key to estimating the impact of these issues for Māori and guiding strategies for how to reduce their frequency and to improve outcomes.^{11,16} Given the ethnic variation between treatment-related hospitalisations and ACC claim acceptance between Māori and non-Māori, review of ACC process around treatment injury claims should be undertaken. This review should include clarity and transparency of data relating to ACC claims and whether this information is understandable and easy for Māori to access. In addition, further investigation of the small proportion of complications of medical and surgical care that are classified and accepted as treatment injuries by ACC is also warranted.

Socio-economic disparities in healthcare quality reflect how the wider determinants of health impact on health outcomes.¹⁶ The current study shows that

Māori patients hospitalised due to a treatment injury or complication of healthcare were more likely to reside in more deprived areas compared to non-Māori. These findings demonstrate an association between the wider determinants of health and rates of treatment injury and complications of care, consistent with other New Zealand literature.^{15,16,30} In addition to deprivation, the interaction between rural and urban living has also been explored with reference to inequitable health outcomes for Māori. Crengle et al. revealed higher rates of amenable mortality in rural Māori compared to urban Māori, indicating differences in access to and quality of care in the rural groups of Māori in New Zealand.³¹ The interaction between rurality and treatment injuries/complications of care warrants further investigation.

The majority of hospitalisations due to complications of care were medication related, in which Māori were overrepresented. An earlier New Zealand study of ACC primary care treatment injury claims among the general population also found that the majority were medication-related.² Medication-related adverse events are the most common and most preventable harm associated with healthcare.^{32,33} This study supports these findings and shows that while medicines are key causes of adverse outcomes, they also contribute towards an inequitable increase in hospitalisation rates for older Māori. The lack of robust evidence exploring the ethnic variation in the quality use of medicines for older adults in New Zealand has been highlighted as an issue, despite higher rates of chronic and comorbid diseases, and subsequent higher rates of medication use, in older age.^{17,34,35} Older Māori have been shown to have reduced access to appropriate medications and have increased adverse medicine effects from inappropriate prescribing.^{16,17,34} This supports a need for further research looking at strategies to facilitate optimal medicines use among older Māori adults, which balances therapeutic potential with risk of harm.

The incidence of both treatment injuries and complications of medical and surgical care resulting in hospital admission increased with age until the age of 80 for both Māori and non-Māori in the present study. Existing New Zealand and international literature shows older adults are disproportionately represented in rates of serious adverse events and treatment injury claims.^{1,7,10,11,17,32} The current study adds to this picture, additionally revealing variation in

treatment injury and complication rates *within* the older age group. This highlights the need for age-focused strategies to promote better outcomes for older patients, such as implementation of pharmacist-led medicine optimisation interventions, using “early rehabilitation after surgery” protocols, and having regular involvement of geriatricians and nurse specialists in older inpatient care.^{32,36,37}

The utilisation of routinely collected population level data is a strength of this study, and the methods used provide an approach which could be replicated to explore ethnic trends in quality of care at a national level. Sources of selection bias and information bias were minimised using pre-specified eligibility criteria and analysis methods. However, the study needs to be considered in light of several limitations. The relatively small number of treatment injury cases (n=296) limited our ability to investigate associated factors. For example, details of the location (i.e., hospital or community based) of the original health intervention leading to the hospital admission and further information of the complications (e.g., medication group or type of surgical misadventure) would be useful and could guide prevention strategies of such events in the future. The classification of treatment injuries and complications of care is reliant on correct coding by trained coders within the hospital system and is open to interpretation. As such, the possibility of misclassification in the coding of primary external cause codes cannot be ruled out. Although we were able to obtain ACC treatment injury claims data through an Official Information Act request, we were not able to cross reference our findings with ACC claims data, which is a potential weakness of this study. Due to the nature of the study relying on routinely collected data, there is an absence of information that could help with the interpretation of the study findings and the implications for prevention, such as the context in which the incident occurred, comprehensive comorbidity information, the severity of injury, and more detailed outcome data. A method has been developed to improve identification of chronic comorbidities from NMDS data, but this requires five years of data prior to the study period and was beyond the scope of this study.³⁸ The collection of this additional information should be considered in future research and may be most suited to a prospective study design. Our data is specific to older adults residing in Lakes and BoP DHBs, and while this limits the generalisability of these findings, similar trends are likely to be present in other parts of New Zealand.

This study highlights inadequacies in the provision of and access to quality and equitable healthcare for Māori.^{9,12,16,28} Further investigation of the total incidence of treatment injury and complications that are responsible for hospital admissions in New Zealand is required to fully understand the impact of these on our healthcare system and on older Māori populations at a national level. Improved national reporting on these events, including disaggregation by age and ethnicity, can guide future healthcare improvement strategies to enhance the safety of older adults utilising primary and secondary healthcare services. The recent New Zealand health system reform and establishment of Te Pou

Hauora Tūmatanui – the Public Health Agency, a unit to provide public health leadership and focus on enabling equity in health outcomes in New Zealand, provides an opportunity for this directorate to take responsibility for such monitoring, reporting, and subsequent action to improve inequities.

These novel findings regarding treatment injury and healthcare complications in a region of New Zealand with high numbers of Māori have highlighted significant ethnic disparities in treatment injury and complication hospitalisations which we posit as a marker of healthcare quality, likely to be evident in other parts of New Zealand, and internationally.

COMPETING INTERESTS

Nil.

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