Adherence to New Zealand's Major Trauma Destination Policy: an audit of current practice

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ABSTRACT

AIM: To evaluate adherence to the New Zealand Major Trauma Destination Policy (MTDP). This audit assessed if, based on their injuries, Emergency Medical Services (EMS) attended major trauma cases were taken to the MTDP determined appropriate hospital. Findings will guide and further improve pre-hospital trauma care and associated patient outcomes.

METHODS: A retrospective evaluation of adherence to the New Zealand MTDP for a random sample of 100 cases (ISS >12) injured between 31 November 2017–30 November 2018 who survived to hospital. The EMS electronic patient record (ePRF) was reviewed for each case. Adherence was indicated by the transport of injured patients from the scene to the appropriate initial destination based on meeting the respective regional MTDPs.

RESULTS: Overall, there was a 94% adherence rate to the MTDP. For patients that were not classified as requiring transport to an advanced-level trauma centre, there was a 98.9% (n=86/87) adherence compared to 61.5% (n=8/13) adherence in those that did require transport to an advanced-level trauma centre.

CONCLUSION: There was high adherence to the MTDP, with 94% of cases being taken to the appropriate destination directly from the incident scene. There is scope for improvement in cases whereby the nearest hospital should be bypassed in favour of a more distant advanced-level trauma centre.

Globally, more than two-thirds (70%) of injury deaths occur in the pre-hospital setting.[1] In New Zealand, 54% of injury deaths occur pre-hospital and 45% of those deaths are estimated to be survivable or potentially survivable.[2] These data suggest that the health burden of major trauma in New Zealand may, in part, be reduced by optimising pre-hospital trauma care, in particular optimising the systems that determine the most appropriate destination for patients in the acute phase of care.[3] International evidence confirms that cases severe enough to be classified as major trauma are likely to have better outcomes if the patient is transported directly to an advanced-level trauma centre, even if this means bypassing the nearest medical facility.[4] With major trauma destinations taking priority over closer, non-trauma centres for transport from the incident site, appropriate resources and hospital personnel are more readily available to patients with severe injury. This model of trauma care was accredited by the American College of Surgeons in 1987 to reduce delayed secondary transfer to trauma centres and reduce pre-hospital injury deaths.[2–4]

Equivalent models of major trauma response protocols have been implemented and audited internationally.[5–7] Findings from these studies reveal that destination protocols are not optimally adhered to and that certain groups experience different rates of adherence. Fitzharris et al.[5] found a major trauma protocol adherence rate of 74% for P4 (most severe) cases by Emergency Medical Service (EMS) providers in Australia.[5] MacKenzie et al.[6] reported 56% of major trauma patients in a US study were transported directly to a major trauma hospital, and that compliance reduced with increasing age and with the type of criteria met in each case. The three types of criteria that could be met included injury, physiology and mechanism criteria (all including parameters/specific incident or injury characteristics used to include or exclude major trauma). Compliance was highest when the injury criteria was met either with or without another criteria (86.0–94.0%). Cases meeting mechanism and physiology criteria together had the next highest compliance rate (68.7%), and the third highest rate of compliance was seen when mechanism criteria alone was met (45.8%). The lowest level of adherence was in cases meeting physiology criteria alone (34%).[6] A 2020 study from the Netherlands by Van

Rein et al. reported a major trauma destination policy adherence rate of 72%, with a lower adherence rate of 42% in rural regions where there was an increased distance to advanced trauma centres.[7] In addition, this study found reduced adherence for older patients, but increased adherence for paediatric patients.

New Zealand's trauma system is divided into four regional trauma networks based on population.[8] Each of these regions has at least one advanced-level trauma centre (seven in total), which are operational 24 hours a day, providing intensive care and advanced resources similar to a Level 1 or Level 2 American College of Surgeons Verified Trauma Centre.[9] In addition to the seven advanced-level trauma centres, the New Zealand trauma system includes 15 mid-level trauma hospitals that are also appropriate for the direct transport of many patients with major trauma based on the criteria they meet at the scene. This makes a total of 22 trauma hospitals across the country. In 2017, New Zealand's National Trauma Network (Te Hononga Whētuki ā-Motu, formerly known as the Major Trauma National Clinical Network) introduced a Major Trauma Destination Policy (MTDP) with the overall aim to improve major trauma survival rates in the pre-hospital trauma response phase.[10] The policy requires EMS providers at the scene to assess if patients meet eligibility criteria for transport to a trauma hospital directly from the scene (Table 1).[3] The New Zealand National Trauma Network uses a threshold for major trauma of an Injury Severity Score (ISS) of greater than 12.[11] Note, ISS is an anatomical injury scoring system.[12]

Despite the establishment of MTDPs, there is evidence world-wide that they are not strictly adhered to, causing preventable fatalities and morbidity post-major trauma.[5–7,13,14] An audit of adherence to the MTDP was undertaken in 2018 by the New Zealand National Trauma Network, Hato Hone St John and Wellington Free Ambulance (WFA) when the MTDP was first introduced (in an email from B. Dicker in January 2022). The audit found that in 91% of cases, transport to the right hospital or staging as per the destination policies was adhered to. The aim of this study was to build on the findings of the 2018 audit to further explore adherence to New Zealand's MTDP.

Materials and methods

This study was part of a larger Health Research Council of New Zealand study exploring predictors of survival among major trauma cases.[2] In the larger study, EMS data from New Zealand's two EMS providers, Hato Hone St John and WFA, were probabilistically linked to NZTR data. To be included in the NZTR, the threshold is an ISS >12 or cases where the trauma is fatal regardless of injury severity. In this audit, the ISS values were abstracted from the NZTR dataset. The auditors were able to access and review all road-based EMS records. In a small number of instances, a combined road/aeromedical record was reviewed. This combined view was only available in limited instances in which the patient record had been transferred to an air provider (to create a merged record), and that air provider used the same electronic record as Hato Hone St John. Around 20% of patients would have had a road-based EMS attendance and aeromedical transport to the hospital. The mode of transport to the hospital was not part of the dataset collected in this audit.

A retrospective evaluation of adherence to the New Zealand MTDP for a random sample of 100 cases (ISS >12) injured between 31 November 2017–30 November 2018, and who survived to hospital, was drawn from the linked dataset.

The study methods mirrored those used in a 2018 MTDP audit conducted by the National Trauma Network (in an email from B. Dicker in January 2022). Cases where the closest hospital to the incident was an advanced-level trauma centre were excluded, on the assumption that EMS personnel by default would go to that hospital. Cases without sufficient information to classify nature or mechanism of injury were also excluded. Any cases excluded from the 100 were replaced by a randomly selected replacement case from the NZTR. The EMS electronic patient record (ePRF) was extracted from the NZTR for each case and reviewed.

Audit process

An audit team was established that included six senior paramedics and one of the study investigators (BD). The audit team received a copy of the ambulance ePRF records for all cases, and based on the information contained, addressed the following questions in relation to the MTDP:

1. According to the MTDP, which hospital did the patient's injuries indicate that they should go directly to?
2. Which hospital did the patient go to?
3. Did the patient have unstable/life-threatening injuries that indicated that they needed to go to the closest hospital?

4. Did the patient have an injury that required a specialist hospital destination, for example spinal cord injury?

The primary outcome of interest in this study was adherence by EMS personnel to the 2019 MTDP. The 2019 protocol was used as it was the current protocol at the time the audit was conducted, and as such was familiar to the paramedics (clinical experts) reviewing the case files. In order to meet the criteria for direct transport to an advanced-level trauma centre or mid-level trauma hospital, a patient must meet the criteria detailed in the Appendices. For the purposes of the audit, adherence was indicated by the transport of injured patients from the scene to the appropriate initial destination based on meeting the respective regional MTDPs (see Appendices).

Adherence to the 2019 MTDP for all cases was determined by the outcomes of the audit team's analysis of each ePRF. The initial review of the cases was conducted by two auditors; if there was no consensus, a third auditor blinded to the initial outcomes reviewed the case, and if the outcome aligned with two of the three auditors, this was utilised. If the first arrival facility was the same as the recommended hospital as indicated by the nature of the patient's injuries, then the case was considered compliant. All cases that were not determined as meeting the criteria for major trauma by the auditors (i.e., no destination policy was required), or cases where patients were sufficiently unstable to need immediate medical attention were classified as adherent if they were taken to the closest hospital. Cases requiring direct transport to a specialist facility were classified as adherent if this occurred.

Other documented variables of interest included: gender, age group, date of injury, district health board (DHB) location of injury catchment, hospitals (initial hospital and on-transfers), definitive care hospital, ISS, patient status at scene and patient status at destination. In cases with multiple injuries, the primary diagnosis and most severe injuries were listed as the primary effect of the incident.

Statistical analysis

Descriptive statistics were used to describe the sample. The proportion of major trauma cases in the sample meeting the 2019 policy criteria for direct transport to one of the 22 major trauma hospitals were noted and the outcome of adherence to the MTDP was then reported.

Ethics

Ethics approval for the parent study was obtained from the Health and Disability Ethics Committee (Ref: 18NTB142).

Results

There were 1,754 cases captured by the NZTR between 31 November 2017 and 30 November

Figure 1: Study population.

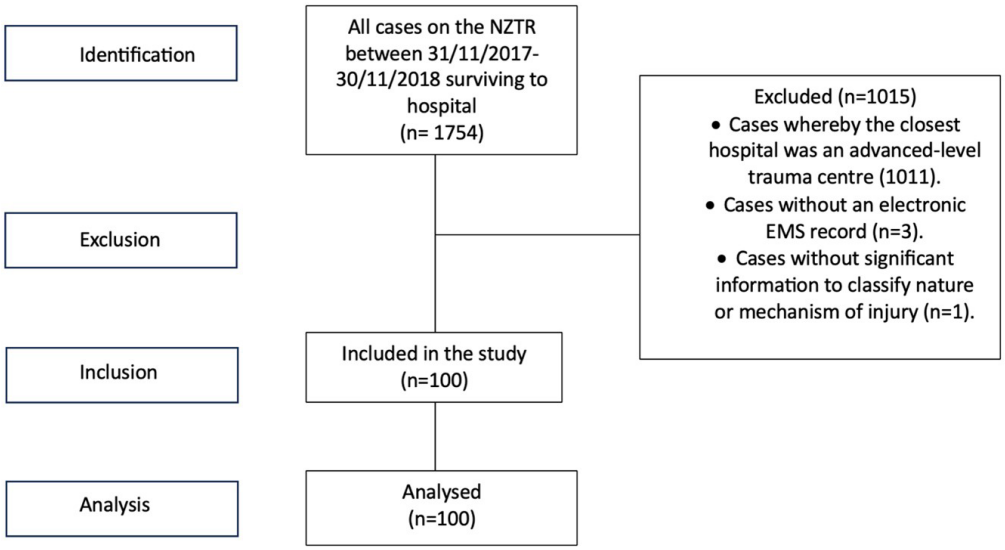

Table 1: Overall adherence to the Major Trauma Destination Policy (n=100).

Appropriate trauma facility	Total	Adherence to MTDP n (%)
Nearest hospital—low severity injury	34	34 (100)
Mid-level trauma hospital	43	42 (97.7)
Advanced-level trauma centre	13	8 (61.5)
Nearest hospital—unstable	10	10 (100)
Total	100	94 (94)

Table 2: Characteristics of audit cases and adherence rates by criteria (n=100).

Variable	n	n (%)
Age (years)		
0–14	3	2 (66.7)
15–64	70	65 (92.9)
65+	27	27 (100)
Sex		
Male	68	62 (91.2)
Female	32	32 (100)
Ethnicity		
Māori	32	28 (87.5)
Non-Māori	68	66 (97.1)

2018 (see Figure 1). Of these, 1,015 were excluded. The majority of those excluded (99.6%) were cases where the closest hospital was an advanced-level trauma centre. A random sample of 100 cases was selected from the 739 cases who met the study eligibility criteria.

Of the initial 100 randomly selected cases, four did not meet the eligibility criteria (three did not have electronic EMS records, and the remaining case had insufficient information regarding the nature of injury and of the incident itself) and were subsequently replaced.

Thirteen of the random sample of patients met the criteria for direct transport to an advanced-level trauma centre (Table 1). Of these, eight were taken to the appropriate destination. Of the 43 cases requiring transport directly to a mid-level trauma hospital, 42 patients were taken to the correct facility. All low-severity and unstable cases (all of which the MTDP requires to be taken to the local hospital) were transported to the correct destination. Overall, there was a 94% adherence rate to the MTDP.

Adherence to the MTDP is increased with age, as compliance improved with every increase in age bracket (Table 2).

Compliance increased with injury severity (Table 3), in contrast to the adherence of "threat to life" status, whereby this audit shows highest adherence in cases with "no" or "unlikely" threat to life both at the scene and in hospital. Adherence to the MTDP varied with different levels of respon-

siveness, with no clear trend evident. In terms of nature of injury, in particular the injury of different organ systems, intra-abdominal injuries had the lowest level of compliance.

Discussion

The aim of this study was to evaluate adherence to New Zealand's MTDP. The 94% adherence rate is high when compared with similar international audits.[5,7] A major contrast can be seen when comparing this study to Newgard et al.'s audit of the triage and destination of low-risk cases in the USA, as 34% of low-risk cases were still transported to advanced-level trauma centres against major trauma protocol recommendations.[15]

Interestingly, although all patients fitted the criteria for major trauma with an ISS >12, over

Table 3: Characteristics of audit cases—percent adherence by criteria (n=100).

Variable	n	Adherence to MTDP n (%)
Injury Severity Score		
<25	70	65 (92.9)
25–49	27	26 (96.3)
>49	3	3 (100)
Clinical status at scene*		
No threat to life	1	1 (100)
Unlikely threat to life	36	36 (100)
Potential threat to life	49	46 (93.9)
Immediate threat to life	14	11 (78.6)
Clinical status final*		
No threat to life	2	2 (100)
Unlikely threat to life	37	37 (100)
Potential threat to life	43	39 (90.7)
Immediate threat to life	18	16 (88.9)
Scene Glasgow Coma Score—Motor		
1–2	5	5 (100)
3–4	4	3 (75)
5–6	84	80 (95.2)
Missing	7	6 (85.7)
Scene Glasgow Coma Score—Total		
3–5	5	5 (100)
6–12	9	7 (77.8)
13–15	79	76 (96.2)
Missing	7	6 (85.7)

Table 3 (continued): Characteristics of audit cases—percent adherence by criteria (n=100).

Hospital Glasgow Coma Score—Motor 1		
1–2	6	6 (100)
3–4	3	3 (100)
5–6	81	75 (92.6)
Missing	10	10 (100)
Hospital Glasgow Coma Score—Total 1		
3–5	9	9 (100)
6–12	6	5 (83.3)
13–15	80	75 (93.8)
Missing	5	5 (100)
Responsiveness		
Alert	84	80 (95.2)
Voice	6	5 (83.3)
Pain	3	3 (100)
Unresponsive	5	4 (80)
Missing	2	2 (100)
Airway status		
Patent (clear)	95	89 (93.7)
Partially obstructed	3	3 (100)
Missing	2	2 (100)
Breathing status		
Effective	93	87 (93.5)
Ineffective	5	5 (100)
Missing	2	2 (100)
Mechanism of injury		
Motor vehicle incident**	57	53 (93.0)
Fall	29	28 (96.6)
Other***	14	13 (92.9)
Nature of injury		
Fractures (excluding skull)	45	44 (97.8)

Table 3 (continued): Characteristics of audit cases—percent adherence by criteria (n=100).

Skull fracture	2	2 (100)
Intracranial injury/TBI/concussion	30	28 (93.3)
Intra-abdominal injury	4	2 (50)
Intrathoracic injury	5	5 (100)
Multisystem injury	3	3 (100)
Spinal cord injury	4	3 (75)
Other****	7	7 (100)

*Clinical status at scene derived from the triage status at the scene, with triage status 1,2,3,4 correlating to immediate, potential, unlikely and no threat to life, respectively.
**Including road traffic incidents, off-road vehicle incidents, incidents involving a pedestrian.
***Includes animal attack/bite (n=2), assault (n=2), collapse (n=6), water sports (n=2), felling a tree, (n=1) unspecified (n=1).
****Includes contusion (n=1), nausea and vomiting (n=1), traumatic amputation (n=1), crush injury (n=2), traumatic pneumothorax (n=1), soft tissue injury to eye (n=1).

one-third of patients were determined by the paramedics as having a final status of being low acuity (clinical status) using the Emergency Ambulance Service Clinical Guidelines.[3] This finding suggests that there may be subsequent patient deterioration or differences in diagnostic capacity using the extensive in-hospital capabilities compared with those available in the pre-hospital environment, meaning that some injuries are occult/not able to be recognised pre-hospital. This finding may provide impetus for optimising EMS training or bringing further diagnostic techniques to the pre-hospital environment. Training of EMS personnel is variable internationally; in New Zealand, there are currently five levels of practice.[16] Of these practice levels, intensive care paramedics (ICP; postgraduate certificate qualified) and critical care paramedics (CCP; postgraduate diploma qualified) are the only qualified personnel that can perform endotracheal intubation, an advanced airway technique. In the rural setting, 74% of EMS attendance is by an ICP or CCP paramedic.[17] Increasing the proportion of CCP or ICP presence would increase the ability to provide critical advanced airway care at the injury site. CCPs or ICPs may also have a higher degree of clinical gestalt, which could enable a higher proportion of bypass of nearby hospitals to go directly to a major trauma centre. However, there would be challenges in resourcing such skills within the rural sector; in addition, the potential for skill attrition would be high due to low exposure to critical incidents. Other potential techniques for future investigation could be tools such as point-of-care ultrasound or lactate measurements, which could provide useful adjuncts to pre-hospital triage.[18,19] The introduction of other more physiological decision support tools, such as the pre-hospital National Early Warning Score, may also aid in supporting future bypass protocols.[20] Any changes in decision support tools and criteria would need to be carefully considered to ensure that such tools do not become overly cumbersome and complex.

This audit found that compliance was high in cases that were not classified as requiring transport to an advanced-level trauma centre at the scene. In comparison, cases needing to bypass the nearest hospital for advanced-level trauma facilities had a significantly lower compliance rate than cases that the protocol dictated should be taken to the nearest hospital—whether due to low severity or because they were unstable—were taken to the appropriate destination. Contrastingly, audits internationally demonstrate higher compliance when protocol requires bypass of nearest medical facilities compared to compliance to destination policy when injuries are less severe, which is the opposite trend to New Zealand.[6,21] MacKenzie et al.'s audit of compliance to major trauma destination protocols in the US found that there was higher compliance to protocols in cases of major trauma than cases that did not meet criteria for direct transport to an

advanced-level trauma centre.[6] An audit from the Netherlands conducted by Voskens et al. found that compliance increased with severity, with a 69% compliance rate in non-severe injury (not classified as major trauma) compared with a 78% compliance rate in more severe injuries that do classify as major trauma.[21] The reasons that a case may not have bypassed the closest centre despite the protocol may include: EMS providers not feeling confident to spend longer in transit with cases of major trauma, reduced awareness of the protocol and criteria for bypass of the nearest hospital or reduced capability to detect occult injury and therefore an under-estimation of severity. Reduced ability to pick up intra-abdominal injury at the scene, as evidenced by a lower compliance rate for major trauma characterised by intra-abdominal injury compared with other natures of injury, may have also contributed to cases of non-compliance to the MTDP.

The low level of compliance for intra-abdominal injuries found in this audit compared with other injury types may suggest that this injury type is less likely to be picked up correctly at the scene, and that recognition of intra-abdominal injuries is not as accurate using standard evaluation techniques at the scene. This suggests that increasing proficiency of detecting intra-abdominal injury at the scene may be a significant factor in increasing adherence rates to the major trauma destination policy. Practical applications of this finding could include training and resource allocation adjustments for FAST scanning/bedside ultrasound at the scene of trauma, or more education around the signs and symptoms of intra-abdominal injury that can be used effectively in the field. The numbers in each nature of injury category were relatively low, and therefore the findings need to be interpreted with caution. No previous published literature was located that had investigated the relationship between nature of injury and adherence to MTDPs.

A strength of this study is its alignment with methodology used in a 2018 New Zealand audit of the MTDP (in an email from B. Dicker in January 2022). The 2018 audit covered the period between 1 July 2017 and 30 June 2018, the present audit covering 31 November 2017 to 30 November 2018, so there is a minor difference in time period, but they are very similar in terms of trauma policy, both just over 1 year following the implementation of the MTDP. Our current methodology, however, has key differences. Firstly, the 2018 National Trauma Network audit over-reported compliance by auditing cases occurring in areas where the closest hospital was, by default, a major trauma hospital. The current methodology excluded cases that occurred in proximity to an advanced-level trauma centre, thereby reducing the possibility of over-reporting compliance. Interestingly, despite the 2018 study finding a 91% compliance rate to the MTDP with the reported limitation of over-estimating adherence, this study's adherence rate was 94%.

A New Zealand study looking at theoretical access to timely advanced-level trauma care identified lower access for Māori (New Zealand's Indigenous population) and older people.[22] These groups also have high rates of injury incidence[14,23] and a disproportionate burden of morbidity post-injury.[24,25] This audit found a difference in adherence for Māori compared with non-Māori patients, with 87.5% and 97.1% adherence rates respectively. This is a notable finding, as effective and adhered-to MTDPs can therefore potentially reduce the health burden on these already vulnerable communities. Due to the sample size of only 100 patients and use of a predominantly rural cohort, we were unable to report on Pacific peoples due to very small numbers. This is a key consideration for future analysis with a larger sample size. Given the exclusion of cases whereby the closest hospital was an advanced-level trauma centre, there were no cases from major centres included. Therefore, while this audit has a large representation of rural communities in the population, there is no way to compare those outcomes with the outcomes of urban communities.

The generalisability of the findings of this audit is limited by the random sample of 100 cases. Additionally, the low numbers of children in the present sample and cases with a high scene ISS (>49) reflect the New Zealand major trauma population but limit the generalisability of these findings to these groups. The experience of the EMS providers who attended the incident was not available in the data reviewed for this study. This information would have been helpful to provide insight into factors that may have impacted adherence. In addition, not all types of major trauma are represented, for example burns or penetrating injuries, limiting the audits' ability to assess MTDP adherence for these injury types. This audit used the 2019 MTDP to determine outcomes of adherence for cases occurring in 2017 for reasons outlined above. Therefore, this audit may have been limited by some minor changes between the 2017 and 2019 destination policies.

Although the cohort is 6 years old, there have been no significant shifts in practice since this time; therefore, the results are likely to still be relevant. In addition, the use of a cohort derived during the COVID-19 epidemic may have resulted in some unknown effects on destination adherence. However, it should be noted that due to New Zealand's strict border closure restrictions during COVID-19, the country did not experience the extent of the overwhelming impact on health services (including EMS) that other countries experienced. A future audit comparing a post-COVID period would be of interest.

Conclusion

The present study found high adherence to the New Zealand MTDP, with the majority (94%) of cases being taken to the appropriate destination directly from the incident scene. Contrastingly to the overall outcome, of those cases classified as meeting the criteria for direct transport to an advanced-level trauma centre, in just over 60% of cases the MTDP was adhered to.

In cases where the appropriate action was to bypass the nearest medical facility, this audit reveals potential scope for improvement, particularly when the injury severity is high. In order to make improvements, it is key that emergency services understand the reasons for the instances when there is non-adherence. Future investigations could seek to inform paramedics of patient final outcomes and whether knowledge of this would lead them to make different decisions in future. Moreover, are there changes that could be made to the pre-hospital destination guidelines to reduce the subjectivity; for instance, perhaps incorporation of physiological measures and/or additional decision support via telehealth or similar need to be made available to paramedics on scene.

COMPETING INTERESTS
HRC project grant 18/465: Auckland and Otago universities received funding to conduct the parent study that this paper forms a part of. One of the authors (Bridget Kool) was PI on that study and part of her salary covered. Data management costs were covered by the study.
Bridget Dicker is an employee of Hato Hone St John and this work was undertaken in "time only" as part of her employment.

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Appendices

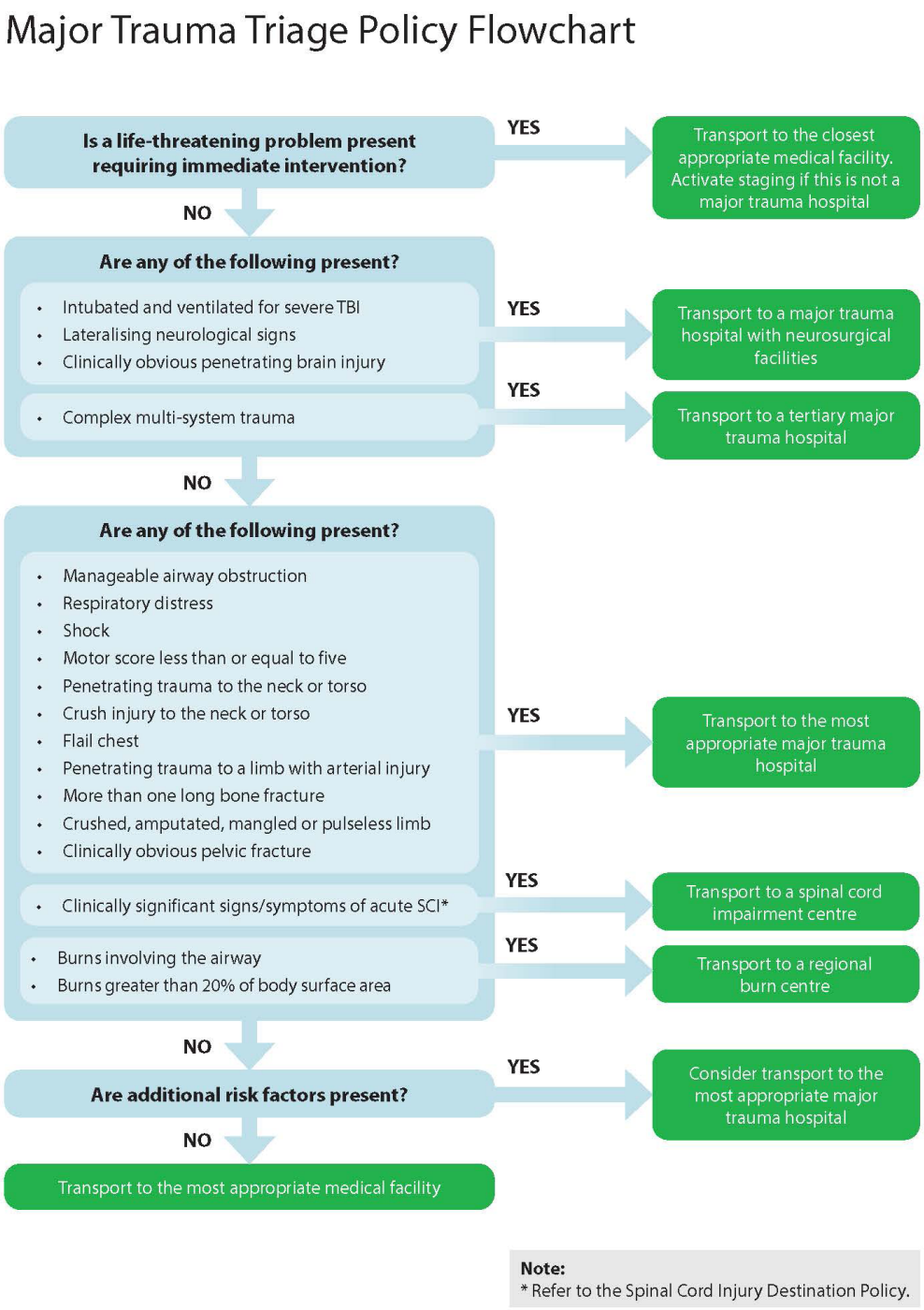
Appendix 1: New Zealand out-of-hospital major trauma triage policy

New Zealand Out-of-Hospital Major Trauma Triage Policy

This document is for the use of clinical personnel when triaging patients with trauma in the out-of-hospital setting in New Zealand. It has been developed by the National Major Trauma Clinical Network in conjunction with the Ambulance Sector.

Publication date October 2020

Appendix 1 (continued): New Zealand out-of-hospital major trauma triage policy



Appendix 1 (continued): New Zealand out-of-hospital major trauma triage policy

Major Trauma Triage Policy: Additional Information

Introduction

The information within this policy complements the major trauma triage flowchart for clinical personnel and should be read in conjunction with it. The major trauma triage flowchart is to be used by clinical personnel (for example ambulance and PRIME personnel) to identify which patients meet criteria for major trauma in the out-of-hospital setting. Patients who have been identified as having major trauma should be transported directly to a major trauma hospital whenever it is feasible and safe to do so.

Major trauma hospitals are those hospitals designated by the Regional Major Trauma Networks to receive patients who have major trauma. Further details are described in Regional Major Trauma Destination Policies.

Determining the most appropriate major trauma hospital

- Few hospitals in New Zealand have the facilities required to treat all the injuries a patient with major trauma may have and this includes many of the hospitals designated as a major trauma hospital. Clinical judgement must be used when determining which major trauma hospital the patient is transported to, taking into account:
  - The information within the Regional Major Trauma Destination Policies.
  - The patient's expected treatment requirements.
  - The transport time to the relevant hospitals.
- In most cases, the most appropriate major trauma hospital will be the closest major trauma hospital. However, in some cases there will be a choice of major trauma hospitals that the patient could be transported to within similar times. In this setting the patient should be transported to the major trauma hospital with the most appropriate facilities to meet the expected treatment needs of the patient.
- Personnel should seek clinical advice if they are uncertain.

Life threatening problems requiring immediate intervention

- It should be rare for a patient with a life-threatening problem to be transported to a medical facility that is not a major trauma hospital, because delays to definitive care worsen outcome. A patient with major trauma should be transported directly to a major trauma hospital unless the patient has an immediately life-threatening problem and there is a clear benefit from transporting the patient to a closer medical facility.
- However, some patients have a life-threatening problem requiring immediate intervention that cannot be provided by personnel at the scene, such that there is a high risk of death before reaching a major trauma hospital and the problem may be able to be rectified at a closer medical facility. Examples include:
  - Severe airway obstruction despite manual techniques and airway adjuncts.
  - Inadequate breathing.
  - Severe external bleeding that is not controlled.
- The closest appropriate medical facility will usually be a hospital, but sometimes it will be a medical centre, particularly in remote areas of New Zealand.
- The decision to transport a patient with a life-threatening problem to a medical facility that is not a major trauma hospital requires clinical judgement and must have a low threshold for seeking clinical advice. The decision should take into account the nature of the patient's injuries, the rate of deterioration, the relative proximity of the medical facilities and the personnel available at the medical facility.
- Personnel in the receiving medical facility must be notified as soon as possible, preferably before leaving the scene.
- Staging must be activated via Comms, preferably before leaving the scene, if the medical facility is not a major trauma hospital.

Appendix 1 (continued): New Zealand out-of-hospital major trauma triage policy

Severe traumatic brain injury (TBI)

- Most patients with severe TBI do not require urgent neurosurgery. However, patients with any of the following clinical features have a high probability of requiring urgent neurosurgery and/or neuro-intensive care and should be transported to a major trauma hospital with neurosurgical facilities, whenever this is feasible and safe:
  - Intubated and ventilated. These patients usually require neuro-intensive care and may require urgent neurosurgery.
  - Lateralising neurological signs, for example unilateral pupil dilatation or unilateral weakness. These patients usually require neurosurgery for extradural or subdural bleeding.
  - Clinically obvious penetrating brain injury. These patients usually require neurosurgery.
- Personnel should have a low threshold for seeking clinical advice if transport to a major trauma hospital with neurosurgical facilities will involve a prolonged flight, particularly if the patient is not intubated and ventilated.

Complex multi-system trauma

- Complex multi-system trauma cannot be tightly defined, and clinical judgement is required, but includes patients with major trauma involving very severe injuries to more than one body region.
- Patients with complex multi-system trauma will usually benefit from transport to a tertiary major trauma hospital that is also a tertiary hospital, provided this is feasible and safe. This is because tertiary major trauma hospitals have additional personnel and facilities to manage patients with complex multi-system trauma.
- Personnel should seek clinical advice prior to commencing transport, if transport to a major trauma hospital that is also a tertiary hospital will involve a prolonged flight.

Abnormal Primary Survey

Airway obstruction

- Clinical judgement is required when determining that the patient has manageable airway obstruction (as per step three in the flowchart), rather than life-threatening airway obstruction requiring immediate intervention (as per step one in the flowchart).
- For the majority of patients their airway obstruction is manageable and they can be adequately oxygenated using airway adjuncts and supplemental oxygen. If this is the case the patient should be transported to a major trauma hospital.

Respiratory distress

- A patient with chest wall bruising or a few isolated rib fractures will often have pain when taking a deep breath, but in order to have respiratory distress the patient must have clinical signs of difficulty breathing or severe pain with normal breathing.

Shock

- Shock is a clinical diagnosis and cannot be tightly defined using specified vital signs.
- Clinical signs of shock include tachycardia (unless the patient is beta-blocked or has 'end stage' shock when the heart rate is falling), a narrowed pulse pressure, vasoconstriction and an altered level of consciousness (usually occurs late in shock particularly in children and young adults and usually manifests as agitation with preservation of the ability to obey commands).
- Blood pressure is a poor guide to the severity of shock and must be considered as part of the overall clinical picture. Blood pressure may only begin to fall when shock is severe and blood pressure varies with age, sex, degree of fitness and medications.
- If an IV fluid bolus is clinically indicated the patient has shock.

Appendix 1 (continued): New Zealand out-of-hospital major trauma triage policy

Motor score of less than or equal to five

- A motor score of less than or equal to five is a more useful predictor of clinically important TBI than the GCS.
- Consider transporting to a major trauma hospital if they have a falling GCS or severe agitation, even if they are obeying commands.
- A patient with alcohol or drug intoxication who has a motor score of less than or equal to five following a mechanism of injury consistent with TBI, should be presumed to have severe TBI until proven otherwise, even if it is suspected that alcohol or drug intoxication is contributing to the altered level of consciousness.

Injury patterns

Penetrating injury to the neck or torso

- To meet the definition of penetrating injury to the neck or torso, there must be a strong clinical impression that the injury has penetrated:
  - The deep tissues when the injured region is the neck.
  - The thoracic cavity when the injured region is the chest.
  - The abdominal cavity when the injured region is the abdomen or pelvis.
- If the patient has a penetrating injury that appears to only involve skin or subcutaneous tissue and the patient's vital signs are normal, clinical judgement should be used and transport may occur to a hospital that is not a major trauma hospital.
- Arterial bleeding from penetrating injuries to the limbs is usually clear, particularly if it involves the brachial, femoral or popliteal artery. However, it is common for there to be some uncertainty as to whether or not bleeding from a limb is arterial. Provided the bleeding has been adequately controlled without a tourniquet and the limb has normal perfusion, clinical judgement should be used and transport may occur to a hospital that is not a major trauma hospital provided the hospital has the facilities to meet the patient's needs.

Crush injury to the neck or torso

- Most patients with a clinically significant crush injury will have an abnormal primary survey and this will trigger the need for transport to a major trauma hospital.
- If the crush injury is not clinically significant and the patient has normal vital signs, clinical judgement should be used and transport may occur to a hospital that is not a major trauma hospital provided the hospital has the facilities to meet the patient's needs.

Flail chest

- Flail chest is a clinical diagnosis. There must be clinical signs of paradoxical chest wall movement with breathing.
- The patient usually has very severe pain, but pain alone is not a diagnostic sign of flail chest.

More than one long bone fracture

- For the purposes of meeting criteria for major trauma, a fractured long bone requires the patient to have a clinically obvious fracture of the shaft of the femur, tibia or humerus.
- A fracture that is clinically isolated to the neck of femur or to the ankle is not considered a long bone fracture.
- No distinction is made between closed and compound fractures for the purpose of meeting criteria for major trauma.

Appendix 1 (continued): New Zealand out-of-hospital major trauma triage policy

Clinically obvious pelvic fracture

- It is rare to make an out-of-hospital diagnosis of a clinically obvious pelvic fracture because this requires an obvious major deformity or clear evidence of a pelvic fracture visible through a wound.
- The most common symptom of a pelvic fracture is the presence of pelvic pain, but the presence of pain alone is not sufficient to diagnose a clinically obvious pelvic fracture.
- There is no role for examining the pelvis for signs of instability or crepitus because the pelvis may be severely unstable without these signs being present and the force required to elicit signs may cause harm.

Spinal cord injury

- Refer to the Spinal Cord Injury Destination Policy.
- If the patient has clinically significant signs and/or symptoms of acute spinal cord injury, the patient should be transported directly to a spinal cord impairment (SCI) centre whenever this is feasible and safe. The patient should be transported to a SCI centre if there are other signs of major trauma in addition to that of spinal cord injury, provided this is feasible and safe, as the SCI centres are also major trauma hospitals.
- If it is not feasible or safe to transport to a SCI centre, for example the patient has other major injuries and is deteriorating, the patient should be transported to the most appropriate major trauma hospital.
- Have a low threshold for seeking clinical advice prior to commencing transport if this will involve a prolonged flight.

Burns greater than 20% of body surface area and burns involving the airway

- Transport the patient to a regional burn centre (Middlemore Hospital, Waikato Hospital, Hutt Hospital or Christchurch Hospital) if the patient has burns of greater than 20% of body surface area or burns involving the airway, provided this is feasible and safe.
- Hutt Hospital is not a major trauma hospital and if there are signs or symptoms of major trauma in addition to the burn injury, the patient must be transported to a major trauma hospital.
- The patient must be transported to a major trauma hospital if they are not transported to a regional burn centre.
- Burns involving the face, hands or genitals may require treatment in a regional burn centre. However, provided the burn injury is less than 10% of TBSA in an adult or less than 5% of TBSA in a child, treatment is not usually time sensitive and the patient should usually be transported to the most appropriate hospital, and subsequently transferred if required.

Additional risk factors

- Consider transporting the patient to a major trauma hospital if the patient has additional risk factors, but does not meet the criteria for having major trauma.
- Signs or symptoms include, but are not limited to:
  - Severe soft tissue injury, particularly if it involves the face.
  - Severe abdominal pain.
- High risk mechanisms of injury include, but are not limited to:
  - Ejection from a vehicle.
  - Fall greater than twice the patient's height.
- Patient risk factors include, but are not limited to:
  - Elderly.
  - Pregnancy.
  - Taking an oral anticoagulant.
  - Known bleeding disorder.

Appendix 1 (continued): New Zealand out-of-hospital major trauma triage policy

- Even in the presence of additional risk factors, if the patient has apparently minor injuries and normal vital signs, clinical judgement should be used and transport should usually occur to the most appropriate hospital, rather than to a major trauma hospital. This is particularly the case if a major trauma hospital is significantly further away than the alternative hospital.

Staging

- The majority of patients with major trauma should be transported directly to a major trauma hospital. However, it is occasionally appropriate for the patient to be transported to another medical facility (one that is not designated as a major trauma hospital) while a helicopter is dispatched to transport the patient to a major trauma hospital. This is termed staging and should only occur when all of the following apply:
  - The patient meets criteria to be transported by helicopter to a major trauma hospital.
  - Transport by road to the major trauma hospital is not appropriate because of distance.
  - The patient has a life-threatening problem requiring immediate intervention that cannot be provided by personnel at the scene.
  - The staging medical facility has personnel and facilities to meet the patient's immediate treatment needs.
  - The patient can be transported to the staging medical facility significantly faster than the helicopter can locate at the scene. 'Significantly faster' cannot be tightly defined and requires clinical judgement.
- When a medical facility is being used as a staging point:
  - The aim of treatment at the staging medical facility is to provide immediate resuscitation/treatment and prepare the patient for helicopter transport.
  - Personnel must notify Comms that the medical facility is being used as a staging point, prior to arrival at the staging centre and preferably before leaving the scene.
  - Personnel in the staging medical facility must be notified as soon as possible that the medical facility is being used as a staging point.
  - An appropriate helicopter and crew will be dispatched as soon as possible and preferably before the patient arrives at the staging medical facility.
  - Air Desk personnel are responsible for immediately arranging transport from the staging facility to a major trauma hospital.
- When a helicopter is being dispatched to a medical facility (including hospitals) that is being used as a staging point:
  - The helicopter mission will be dispatched as an out-of-hospital job and not as an inter-hospital transfer.
  - The clinical care of the patient during transfer will be provided by the helicopter crew.
  - If a doctor is available to be part of the usual helicopter crew they will be dispatched whenever this is feasible.
- If the patient is transported to a hospital and personnel are not using the hospital as a staging point and a decision is made by hospital staff to request a helicopter after the patient has arrived at that hospital, this mission/job will be dispatched as an inter-hospital transfer.

Additional information

Determining the most appropriate medical facility

- If the patient does not meet criteria to be transported directly to a major trauma hospital, they should be transported to the most appropriate medical facility, taking into account:
  - The location of the scene.
  - The anticipated healthcare needs of the patient.
  - Where the patient lives.
- The patient should be transported to a medical facility capable of meeting their anticipated healthcare needs whenever this is feasible. For example, a patient with a compound fracture should be transported to a hospital with orthopaedic surgical facilities and a patient with minor injuries should be transported to an appropriate medical centre.

Appendix 1 (continued): New Zealand out-of-hospital major trauma triage policy

Patients that rapidly improve without treatment

- A patient may initially meet criteria for major trauma but then rapidly improve without specific treatment.
- For example, a patient may have lost consciousness and then rapidly recovered, or had respiratory distress from an emotional cause that has rapidly improved.
- Provided the patient is very clearly improving and meets no other criteria for major trauma, clinical judgement should be used and transport may occur to a hospital which is not a major trauma hospital.

Ambulance status codes

- Status codes cannot be used to define the presence or absence of major trauma, for example not all patients assigned a status code of two will have major trauma.
- The major trauma triage criteria must be used to determine whether or not the patient has major trauma.

Appendix 2: New Zealand out-of-hospital major trauma destination policy—Northland and Auckland areas

New Zealand Out-of-Hospital Major Trauma Destination Policy

Northland and Auckland Areas

This document is for the use of clinical personnel when determining the destination hospital for patients with major trauma in the out-of-hospital setting in the Northland and Auckland Areas of New Zealand. It has been developed by the Northern Regional Major Trauma Network in conjunction with the National Major Trauma Clinical Network and the Ambulance Sector.

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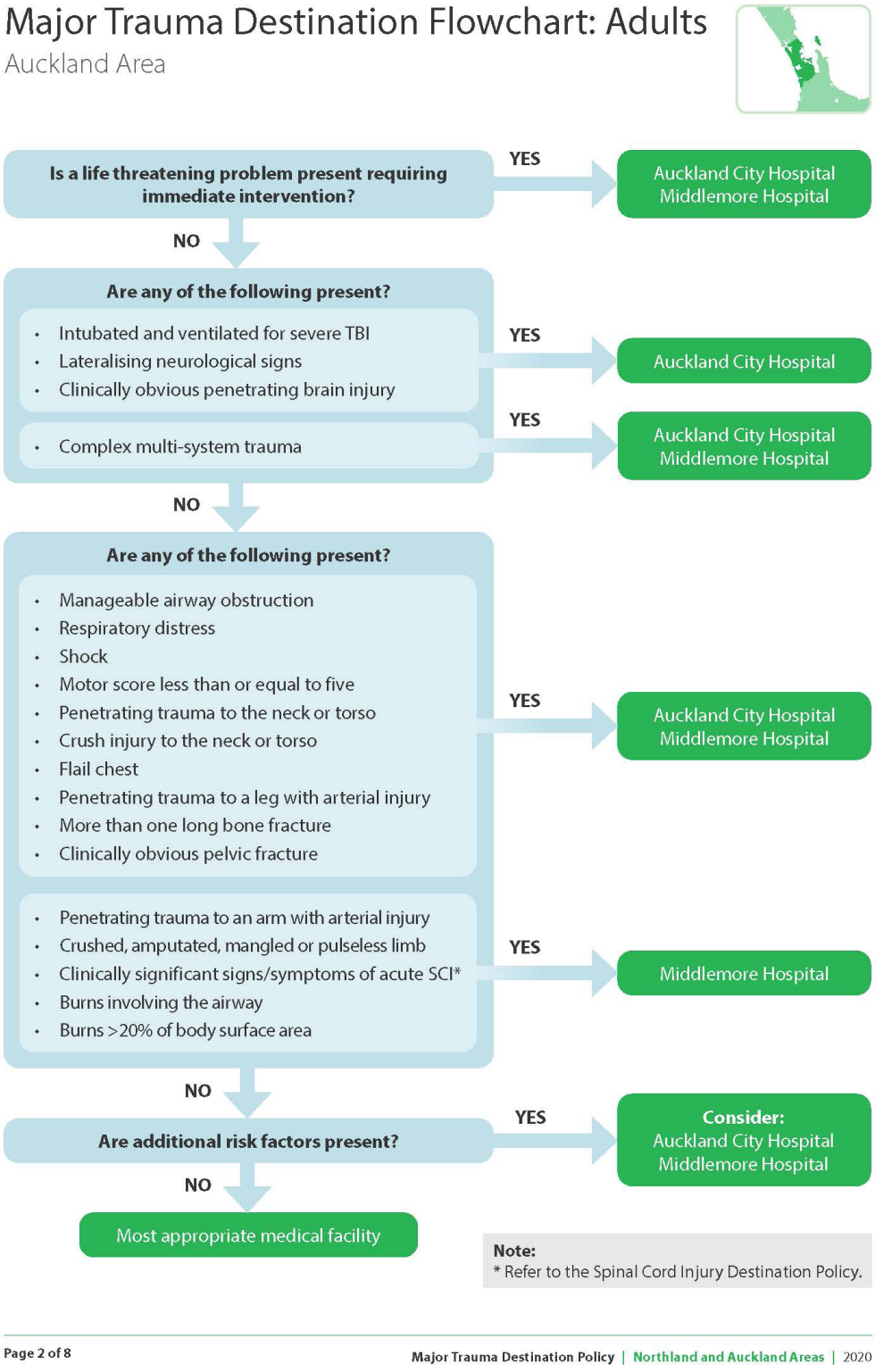
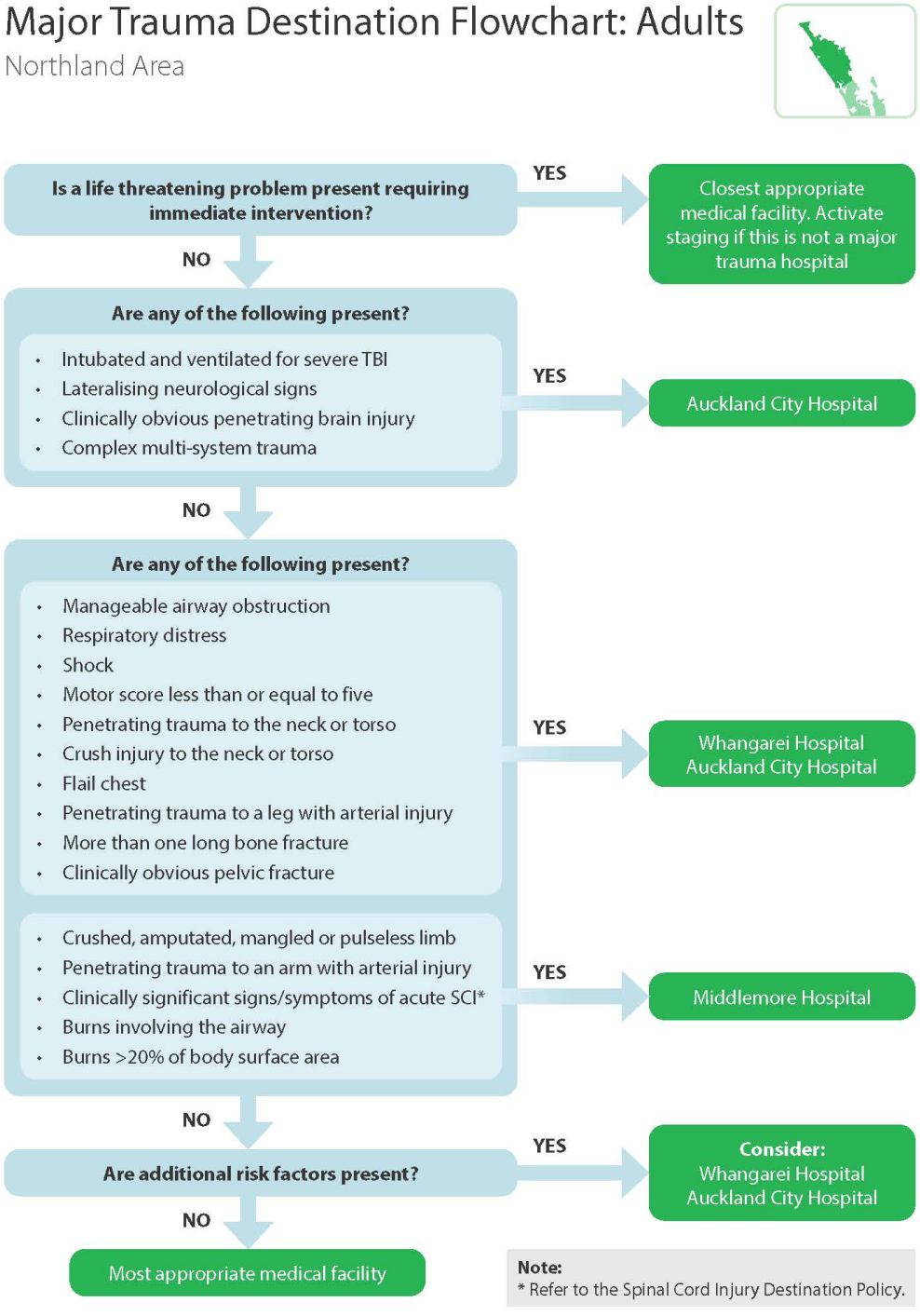
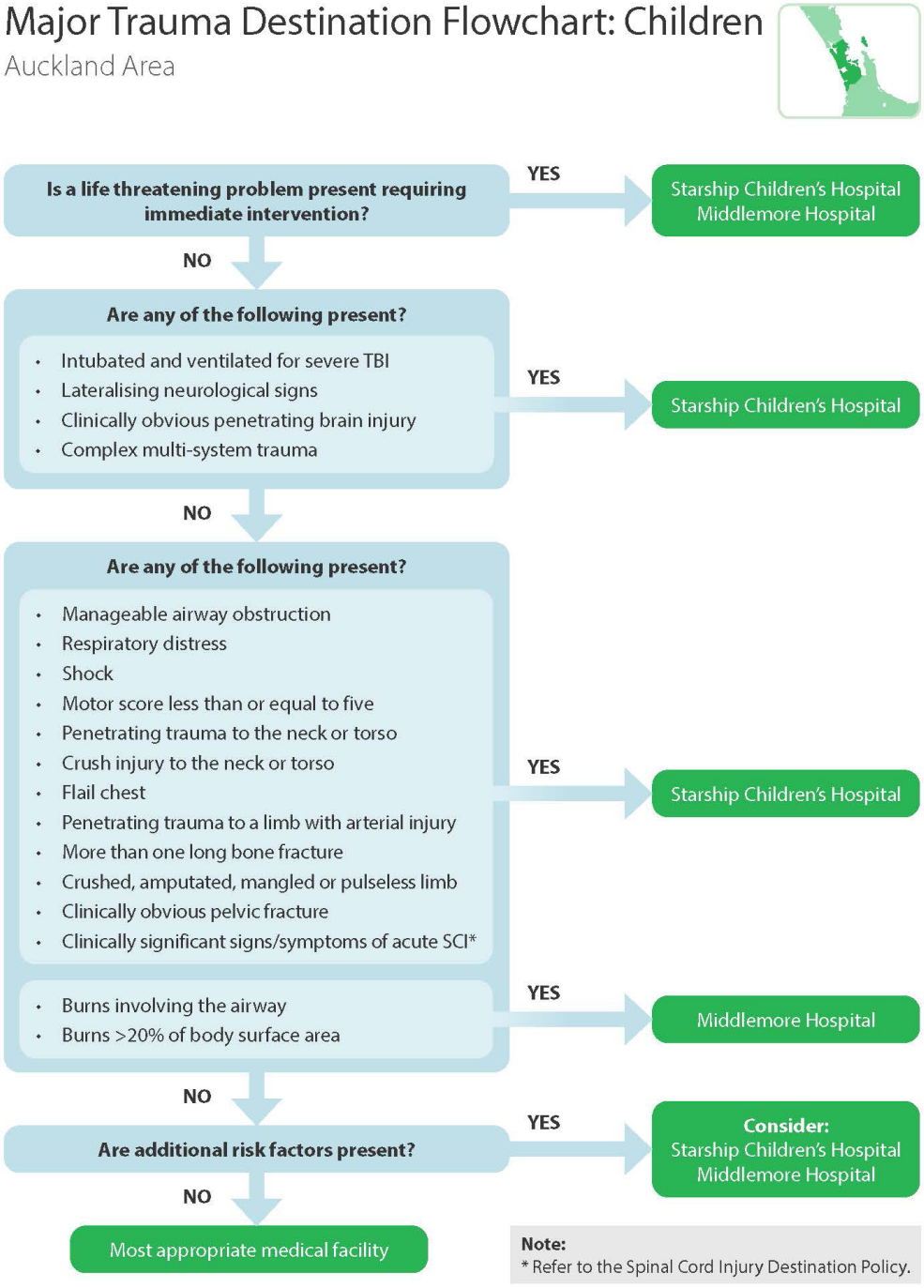
Appendix 2 (continued): New Zealand out-of-hospital major trauma destination policy—Northland and Auckland areas



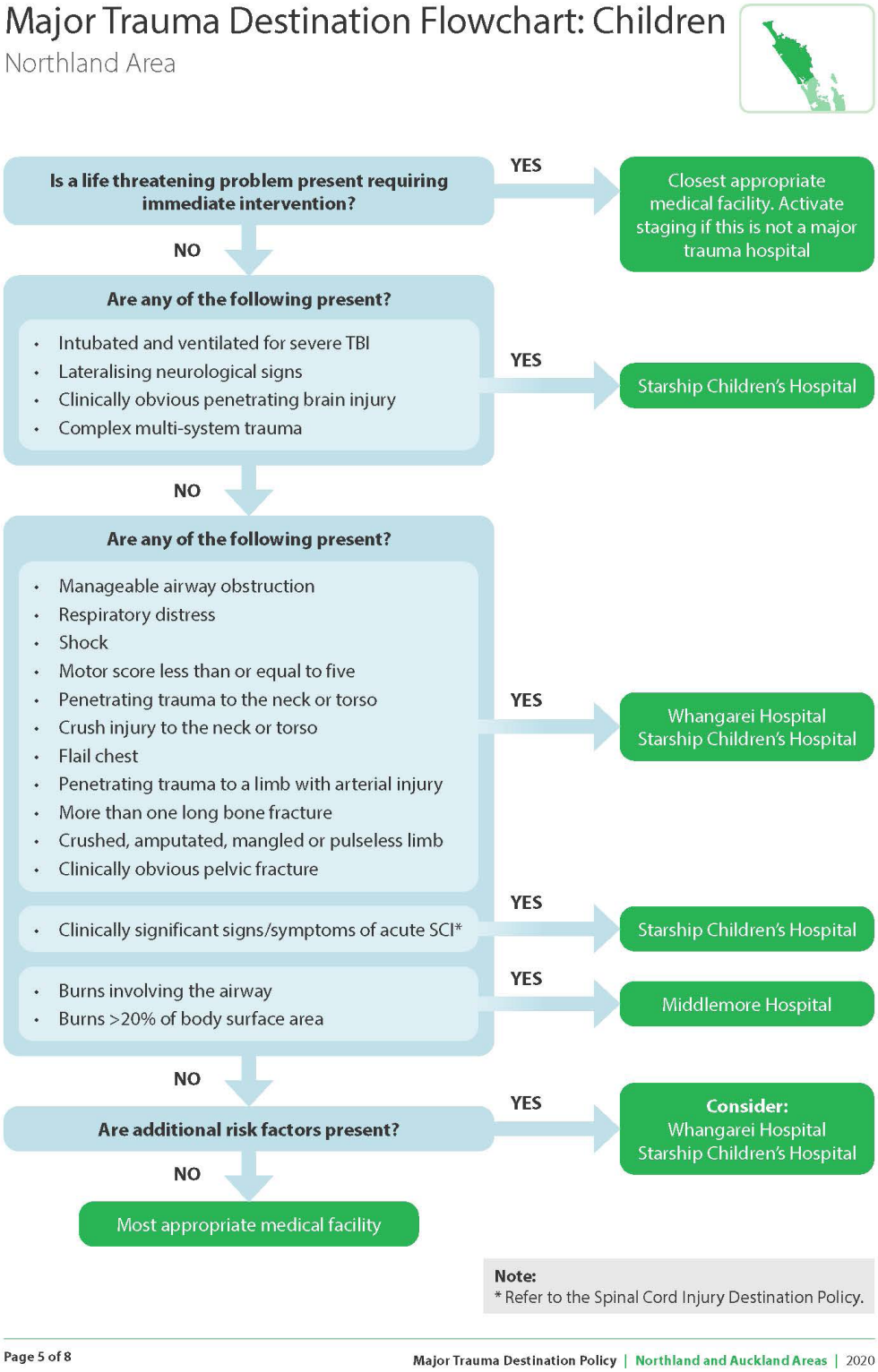
Appendix 2 (continued): New Zealand out-of-hospital major trauma destination policy—Northland and Auckland areas



Appendix 2 (continued): New Zealand out-of-hospital major trauma destination policy—Northland and Auckland areas



Appendix 2 (continued): New Zealand out-of-hospital major trauma destination policy—Northland and Auckland areas



Appendix 2 (continued): New Zealand out-of-hospital major trauma destination policy—Northland and Auckland areas

Major Trauma Destination Policy: Northland and Auckland Areas

Additional Information

Introduction

- This policy is for the use of personnel in the out-of-hospital setting, when determining the transport destination for patients with major trauma in the Northland and Auckland areas of New Zealand.
- It should be read in conjunction with the New Zealand Out-of-Hospital Major Trauma Triage Policy, the National Major Trauma Network Staging Guidelines, the New Zealand Spinal Cord Injury Destination Policy and the Ambulance Sector Clinical Procedures and Guidelines (CPGs).
- The goal of this policy is to ensure that patients with major trauma are transported directly to the most appropriate major trauma hospital, whenever it is feasible and safe to do so.

Major trauma hospitals

- The following hospitals are designated to receive patients with major trauma:
  - Whangarei Hospital (adults and children).
  - Auckland City Hospital (adults only).
  - Starship Children's Hospital (children only).
  - Middlemore Hospital (adults and children*).

  ***Note:** Middlemore Hospital is only designated to receive children with burns and children with a life-threatening problem requiring immediate intervention.
- The following hospitals are tertiary major trauma hospitals:
  - Auckland City Hospital (adults only).
  - Starship Children's Hospital (children only).
  - Middlemore Hospital (adults only).

Determining the most appropriate major trauma hospital

- The flowcharts describe the preferred major trauma hospital/s, based on the best descriptor of the patient's clinical condition.
- The patient should be transported to the preferred major trauma hospital as described in the flowchart, whenever it is feasible and safe to do so.
- If it is not feasible or safe to transport the patient to the preferred major trauma hospital or more than one major trauma hospital is listed as an option, the patient should be transported to the most appropriate major trauma hospital. This will usually be the nearest major trauma hospital, but it may be appropriate to transport the patient to another major trauma hospital if that hospital has the most appropriate facilities to meet the patient's needs.
- Personnel will determine the most appropriate major trauma hospital taking into account all of the following:
  - The information within this policy.
  - The patient's expected treatment requirements.
  - The transport time to the relevant hospitals.
- Personnel should have a low threshold for seeking clinical advice if the transport time to the chosen major trauma hospital is significantly longer (this is not defined and requires clinical judgement) than the transport time to the nearest major trauma hospital.

Appendix 2 (continued): New Zealand out-of-hospital major trauma destination policy—Northland and Auckland areas

Life threatening problems requiring immediate intervention

- Auckland Area: the size and geography of the Auckland Area is such that the patient should be transported to a major trauma hospital, even in the presence of a life-threatening problem requiring immediate intervention.
- Northland Area: the size and geography of the Northland Area is such that the patient should be transported to the closest appropriate medical facility if they have a life-threatening problem requiring immediate intervention that cannot be provided by personnel at the scene:
  - The decision to transport a patient with a life-threatening problem to a medical facility that is not a major trauma hospital requires clinical judgement and personnel must have a low threshold for seeking clinical advice. The decision should take into account the nature of the patient's injuries, the rate of deterioration, the relative proximity of the medical facilities and the personnel available at the medical facility.
  - Staging must be activated via Comms, preferably before leaving the scene, if the medical facility is not a major trauma hospital.
  - Personnel in the receiving medical facility must be notified as soon as possible, preferably before leaving the scene.

Severe traumatic brain injury (TBI)

- Most patients with severe TBI do not require urgent neurosurgery. However, patients with any of the following clinical features have a high probability of requiring urgent neurosurgery and/or neuro-intensive care and should be transported to Auckland Hospital (adults) or Starship Children's Hospital (children) whenever it is feasible and safe to do so:
  - Intubated and ventilated **or**
  - Lateralising neurological signs, for example unilateral pupil dilatation or unilateral weakness **or**
  - Clinically obvious penetrating brain injury.
- Auckland Area: patients with the above clinical features should be transported to Auckland City Hospital (adults) or Starship Children's Hospital (children), even if the scene is south of Middlemore Hospital, unless there is a compelling reason to transport to Middlemore Hospital.
- Northland Area: patients with the above clinical features should be transported to Auckland City Hospital (adults) or Starship Children's Hospital (children) if a helicopter is immediately available, unless there is a compelling reason to transport to Whangarei Hospital.

Complex multi-system trauma

- Complex multi-system trauma cannot be tightly defined and clinical judgement is required, but includes patients with major trauma involving very severe injuries to more than one body region.
- Auckland Area: patients with complex multi-system trauma should be transported to Auckland City Hospital (adults), Middlemore Hospital (adults) or Starship Children's Hospital (children).
- Northland Area: patients with complex multi-system trauma should be transported to Auckland City Hospital (adults) or Starship Children's Hospital (children) if a helicopter is immediately available, unless there is a compelling reason to transport to Whangarei Hospital.

Appendix 2 (continued): New Zealand out-of-hospital major trauma destination policy—Northland and Auckland areas

Limb injuries

- A differentiation has been made within the flowcharts between adults with an upper limb injury involving arterial injury and adults with a lower limb injury involving arterial injury.
- Adults with an upper limb injury involving arterial injury should be transported to Middlemore Hospital. This is because a combined approach involving plastic surgery and vascular surgery is almost always required and these services are only both available at Middlemore Hospital.
  - Auckland area: adults should be transported to Middlemore Hospital unless there is a compelling reason to transport to Auckland City Hospital.
  - Northland area: adults should be transported to Middlemore Hospital if a helicopter is immediately available, unless there is a compelling reason to transport to Whangarei Hospital.
- Adults with limb injury involving crush, amputation or mangling should be transported to Middlemore Hospital. This is because a combined approach involving plastic surgery and orthopaedic surgery is almost always required and these services are only both available at Middlemore Hospital.
  - Auckland area: adults should be transported to Middlemore Hospital unless there is a compelling reason to transport to Auckland City Hospital.
  - Northland area: adults should be transported to Middlemore Hospital if a helicopter is immediately available, unless there is a compelling reason to transport to Whangarei Hospital.
- Children with limb injuries involving arterial injury, crush, amputation or mangling:
  - Auckland area: children should be transported to Starship Children's Hospital unless there is a compelling reason to transport to Middlemore Hospital.
  - Northland area: children should be transported to Starship Children's Hospital if a helicopter is immediately available, unless there is a compelling reason to transport to Whangarei Hospital.

Burns

- Patients with a burn injury of greater than 20% of TBSA or burns involving the airway should be transported to Middlemore Hospital (if feasible and safe), including patients in the Northland area.
- Patients with a burn injury greater than 10% of TBSA in an adult or greater than 5% of TBSA in a child should be transported to Middlemore Hospital (including patients in the Northland Area) or to a hospital with surgical facilities.
- Burns involving the face, hands or genitals may require treatment in a regional burn centre. However, provided the burn injury is less than 10% of TBSA in an adult or less than 5% of TBSA in a child, treatment is not usually time sensitive and the patient should usually be transported to the most appropriate hospital, and subsequently transferred if required.

Appendix 3: New Zealand out-of-hospital major trauma destination policy—Midland area

New Zealand Out-of-Hospital Major Trauma Destination Policy

Midland Area

This document is for the use of clinical personnel when determining the destination hospital for patients with major trauma in the out-of-hospital setting in the Midland Area of New Zealand. It has been developed by the Midland Trauma System in conjunction with the National Major Trauma Clinical Network and the Ambulance Sector.

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Appendix 3 (continued): New Zealand out-of-hospital major trauma destination policy—Midland area

Major Trauma Destination Matrix

Midland Area

Area	Waikato					Bay of Plenty		Lakes		Taranaki		Tairawhiti
Incident Locality	WKO	THA	TOK	TAU	TEK	TGA	WHK	ROT	TPO	TBH	HAW	GIS
Condition	**Destination hospital**											
Life threatening problem requiring immediate medical intervention	Closest appropriate medical facility. Activate staging if this is not a major trauma hospital											
Severe TBI likely to require urgent neurosurgery[1] (aged ≥2 years)	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO
Severe TBI likely to require urgent neurosurgery[1] (aged <2 years)	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH
Complex multi-system trauma	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	GIS[2]
Manageable airway obstruction	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Respiratory distress	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Shock	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Motor score less than or equal to five	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	WKO	TBH	TBH	GIS
Penetrating injury to the neck or torso	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Crush injury to the neck or torso	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Flail chest	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Penetrating trauma to a limb with arterial injury	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
More than one long bone fracture	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Crushed, amputated, mangled or pulseless limb	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	TBH	TBH	GIS
Clinically obvious pelvic fracture	WKO	WKO	WKO	WKO	WKO	TGA	TGA	WKO	WKO	TBH	TBH	GIS
Clinically significant signs/symptoms of isolated spinal cord injury[3] (≥15 years)	MMH	MMH	MMH	MMH	MMH	MMH	MMH	MMH	MMH	CCH	CCH	MMH
Clinically significant signs/symptoms of isolated spinal cord injury[3] (<15 years)	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH
Burns involving the airway	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO
Burns >10% of body surface area (≥15 years)	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO
Burns >5% of body surface area (<15 years)	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO
Major facial injuries with obvious deformity	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO

Transport direct to the destination listed provided it is feasible and safe to do so

CCH	Christchurch Hospital	**TEK**	Te Kuiti Hospital
GIS	Gisborne Hospital	**TGA**	Tauranga Hospital
HAW	Hawera Hospital	**THA**	Thames Hospital
MMH	Middlemore Hospital	**TOK**	Tokoroa Hospital
ROT	Rotorua Hospital	**TPO**	Taupo Hospital
SSH	Starship Hospital	**WHK**	Whakatane Hospital
TAU	Taumarunui Hospital	**WKO**	Waikato Hospital
TBH	Taranaki Base Hospital		

Notes:

- [1]Criteria for severe TBI likely to require urgent neurosurgery: Patient has been intubated and ventilated or has lateralising neurological signs (for example unilateral pupil dilatation or unilateral weakness) or has a clinically obvious penetrating brain injury.
- [2]Patients with complex multi-system trauma will only be transported to Gisborne Hospital by road. All patients with complex multi-system trauma in the Tairawhiti Area being transported by helicopter will be transported to Waikato Hospital provided it is feasible and safe to do so.
- [3]Criteria for clinically significant signs/symptoms of isolated spinal cord injury include: Paraplegia, quadriplegia, clinically significant limb weakness or clinically significant loss of sensation.

Appendix 3 (continued): New Zealand out-of-hospital major trauma destination policy—Midland area

Major Trauma Destination Policy: Midland Area

Additional Information

Introduction

- This policy is for the use of personnel in the out-of-hospital setting, when determining the transport destination for patients with major trauma in the Midland Area of New Zealand.
- It should be read in conjunction with the New Zealand Out-of-Hospital Major Trauma Triage Policy, the National Major Trauma Network Staging Guidelines, the New Zealand Spinal Cord Injury Destination Policy and the Ambulance Sector Clinical Procedures and Guidelines (CPGs).
- The goal of this policy is to ensure that patients with major trauma are transported directly to the most appropriate major trauma hospital, whenever it is feasible and safe to do so.

Major trauma hospitals

- The following hospitals are designated to receive patients with major trauma:
  - Waikato Hospital.
  - Tauranga Hospital.
  - Rotorua Hospital.
  - Gisborne Hospital.
  - Taranaki Base Hospital.
  - Starship Children's Hospital.
- Waikato Hospital is the tertiary major trauma hospital.

Determining the most appropriate major trauma hospital

- The destination matrix describes the preferred major trauma hospital, based on the best descriptor of the patient's clinical condition.
- The patient should be transported to the preferred major trauma hospital as described in the matrix, whenever it is feasible and safe to do so.
- To use the matrix:
  - Begin at the top and choose the locality that best matches the location of the incident.
  - Go down the matrix to the condition that best describes the patient's known injuries.
  - The hospital listed is the preferred major trauma hospital.
- If it is not feasible or safe to transport the patient to the preferred major trauma hospital, the patient should be transported to the most appropriate major trauma hospital. This will usually be the nearest major trauma hospital, but it may be appropriate to transport the patient to another major trauma hospital if that hospital has the appropriate facilities to meet the patient's needs.
- Personnel will determine the most appropriate major trauma hospital taking into account all of the following:
  - The information within this policy.
  - The patient's expected treatment requirements.
  - The transport time to the relevant hospitals
- Personnel should seek clinical advice if there is deviation from the matrix

Appendix 3 (continued): New Zealand out-of-hospital major trauma destination policy—Midland area

Life threatening problems requiring immediate intervention

- Transport the patient to the closest appropriate medical facility if the patient has a life-threatening problem requiring immediate intervention that cannot be provided by personnel at the scene.
- The decision to transport a patient with a life-threatening problem to a medical facility that is not a major trauma hospital requires clinical judgement and must have a low threshold for seeking clinical advice. The decision should take into account the nature of the patient's injuries, the rate of deterioration, the relative proximity of the medical facilities and the personnel available at the medical facility.
- Staging must be activated via Comms, preferably before leaving the scene, if the medical facility is not a major trauma hospital.
- Personnel in the receiving medical facility must be notified as soon as possible, preferably before leaving the scene.

Severe traumatic brain injury (TBI)

- Most patients with severe TBI do not require urgent neurosurgery. However, patients with any of the following clinical features have a high probability of requiring urgent neurosurgery and/or neuro-intensive care and should be transported to Waikato Hospital (if 2 years of age or older), or Starship Children's Hospital (less than under 2 years of age) whenever it is feasible and safe to do so:
  - Intubated and ventilated **or**
  - Lateralising neurological signs, for example unilateral pupil dilatation or unilateral weakness **or**
  - Clinically obvious penetrating brain injury.
- Personnel should seek clinical advice if transport to Waikato Hospital or Starship Children's Hospital will involve a prolonged flight, particularly if the patient is not intubated and ventilated.

Complex multi-system trauma

- Complex multi-system trauma cannot be tightly defined, and clinical judgement is required, but includes patients with major trauma involving very severe injuries to more than one body region.
- Patients with complex multi-system trauma should be transported to Waikato Hospital, provided this is feasible and safe.
- Patients with complex multi-system trauma in the Tairawhiti Area will only be transported to Gisborne Hospital by road. All patients with complex multi-system trauma in the Tairawhiti Area being transported by helicopter will be transported to Waikato Hospital provided it is feasible and safe to do so.
- Personnel should have a low threshold for seeking clinical advice if transport to Waikato Hospital will involve a prolonged flight.

Burns

- Patients with burn injury should be transported to Waikato Hospital in the following circumstances whenever it is feasible and safe to do so:
  - Burns of greater than 10% TBSA in an adult or 5% in a child.
  - Burns involving the airway.
- Burns involving the face, hands or genitals may require treatment at Waikato Hospital, however, treatment is not usually time sensitive and the patient should usually be transported to the most appropriate secondary hospital and be subsequently transferred if required.

Appendix 4: New Zealand out-of-hospital major trauma destination policy—Lower North Island area

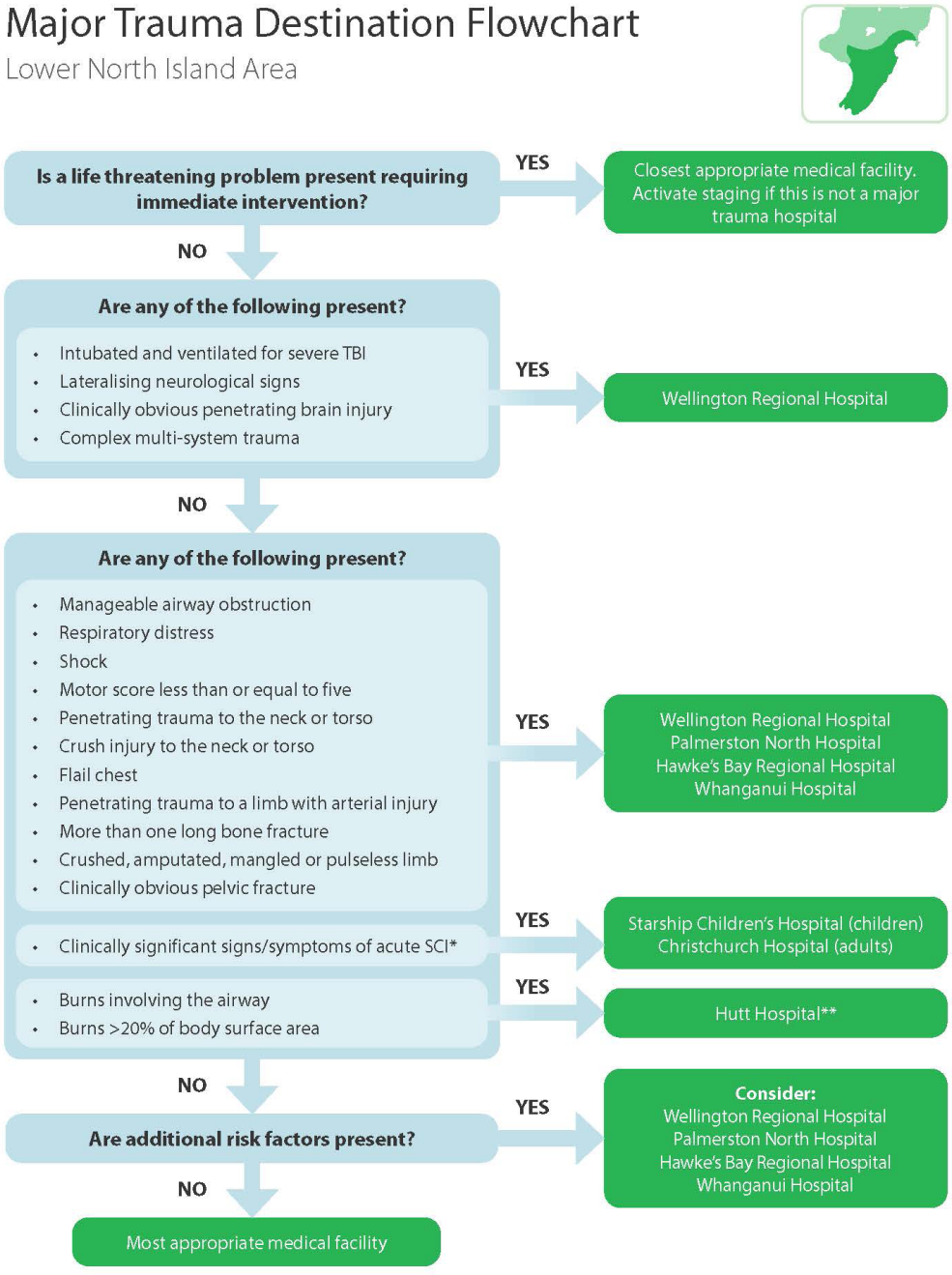
New Zealand Out-of-Hospital Major Trauma Destination Policy

Lower North Island Area

This document is for the use of clinical personnel when determining the destination hospital for patients with major trauma in the out-of-hospital setting in the Lower North Island Area of New Zealand. It has been developed by the Central Regional Major Trauma Network in conjunction with the National Major Trauma Clinical Network and the Ambulance Sector.

Publication date October 2020

Appendix 4 (continued): New Zealand out-of-hospital major trauma destination policy—Lower North Island area



Appendix 4 (continued): New Zealand out-of-hospital major trauma destination policy—Lower North Island area

Major Trauma Destination Policy: Lower North Island Area

Additional Information

Introduction

- This policy is for the use of personnel in the out-of-hospital setting, when determining the transport destination for patients with major trauma in the Lower North Island Area of New Zealand.
- It should be read in conjunction with the New Zealand Out-of-Hospital Major Trauma Triage Policy, the National Major Trauma Network Staging Guidelines, the New Zealand Spinal Cord Injury Destination Policy and the Ambulance Sector Clinical Procedures and Guidelines (CPGs).
- The goal of this policy is to ensure that patients with major trauma are transported directly to the most appropriate major trauma hospital, whenever it is feasible and safe to do so.

Major trauma hospitals

- The following hospitals are designated to receive patients with major trauma:
  - Hawke's Bay Regional Hospital.
  - Whanganui Hospital.
  - Palmerston North Hospital.
  - Wellington Regional Hospital.
- Wellington Regional Hospital is the tertiary major trauma hospital.

Determining the most appropriate major trauma hospital

- The flowchart describes the preferred major trauma hospital/s, based on the best descriptor of the patient's clinical condition.
- The patient should be transported to the preferred major trauma hospital as described in the flowchart, whenever it is feasible and safe to do so.
- If it is not feasible or safe to transport the patient to the preferred major trauma hospital or more than one major trauma hospital is listed as an option, the patient should be transported to the most appropriate major trauma hospital. This will usually be the nearest major trauma hospital, but it may be appropriate to transport the patient to another major trauma hospital if that hospital has the most appropriate facilities to meet the patient's needs.
- Personnel will determine the most appropriate major trauma hospital taking into account all of the following:
  - The information within this policy.
  - The patient's expected treatment requirements.
  - The transport time to the relevant hospitals.
- Personnel should have a low threshold for seeking clinical advice if the transport time to the chosen major trauma hospital is significantly longer (this is not defined and requires clinical judgement) than the transport time to the nearest major trauma hospital.

Appendix 4 (continued): New Zealand out-of-hospital major trauma destination policy—Lower North Island area

Life threatening problems requiring immediate intervention

- Transport the patient to the closest appropriate medical facility if the patient has a life-threatening problem requiring immediate intervention that cannot be provided by personnel at the scene.
- The decision to transport a patient with a life-threatening problem to a medical facility that is not a major trauma hospital requires clinical judgement and personnel must have a low threshold for seeking clinical advice. The decision should take into account the nature of the patient's injuries, the rate of deterioration, the relative proximity of the medical facilities and the personnel available at the medical facility.
- Staging must be activated via Comms, preferably before leaving the scene, if the medical facility is not a major trauma hospital.
- Personnel in the receiving medical facility must be notified as soon as possible, preferably before leaving the scene.

Severe traumatic brain injury (TBI)

- Most patients with severe TBI do not require urgent neurosurgery. However, patients with any of the following clinical features have a high probability of requiring urgent neurosurgery and/or neuro-intensive care and should be transported to Wellington Regional Hospital whenever it is feasible and safe to do so:
  - Intubated and ventilated **or**
  - Lateralising neurological signs, for example unilateral pupil dilatation or unilateral weakness **or**
  - Clinically obvious penetrating brain injury.
- Personnel should have a low threshold for seeking clinical advice if transport to Wellington Regional Hospital will involve a long flight, particularly if the patient is not intubated and ventilated.

Complex multi-system trauma

- Complex multi-system trauma cannot be tightly defined and clinical judgement is required, but includes patients with major trauma involving very severe injuries to more than one body region.
- Patients with complex multi-system trauma will usually benefit from transport to Wellington Regional Hospital, provided this is feasible and safe.
- Personnel should have a low threshold for seeking clinical advice if transport to Wellington Regional Hospital will involve a prolonged flight.

Burns

- Patients with a burn injury of greater than 20% of TBSA or burns involving the airway should be transported to Hutt Hospital, if feasible and safe. Hutt Hospital is not a major trauma hospital and if there are signs or symptoms of major trauma in addition to the burn injury, the patient must be transported to a major trauma hospital.
- Patients with a burn injury greater than 10% of TBSA in an adult or greater than 5% of TBSA in a child should be transported to Hutt Hospital or to a hospital with surgical facilities.
- Burns involving the face, hands or genitals may require treatment in a regional burn centre. However, provided the burn injury is less than 10% of TBSA in an adult or less than 5% of TBSA in a child, treatment is not usually time sensitive and the patient should usually be transported to the most appropriate hospital, and subsequently transferred if required.

Appendix 5: New Zealand out-of-hospital major trauma destination policy—South Island

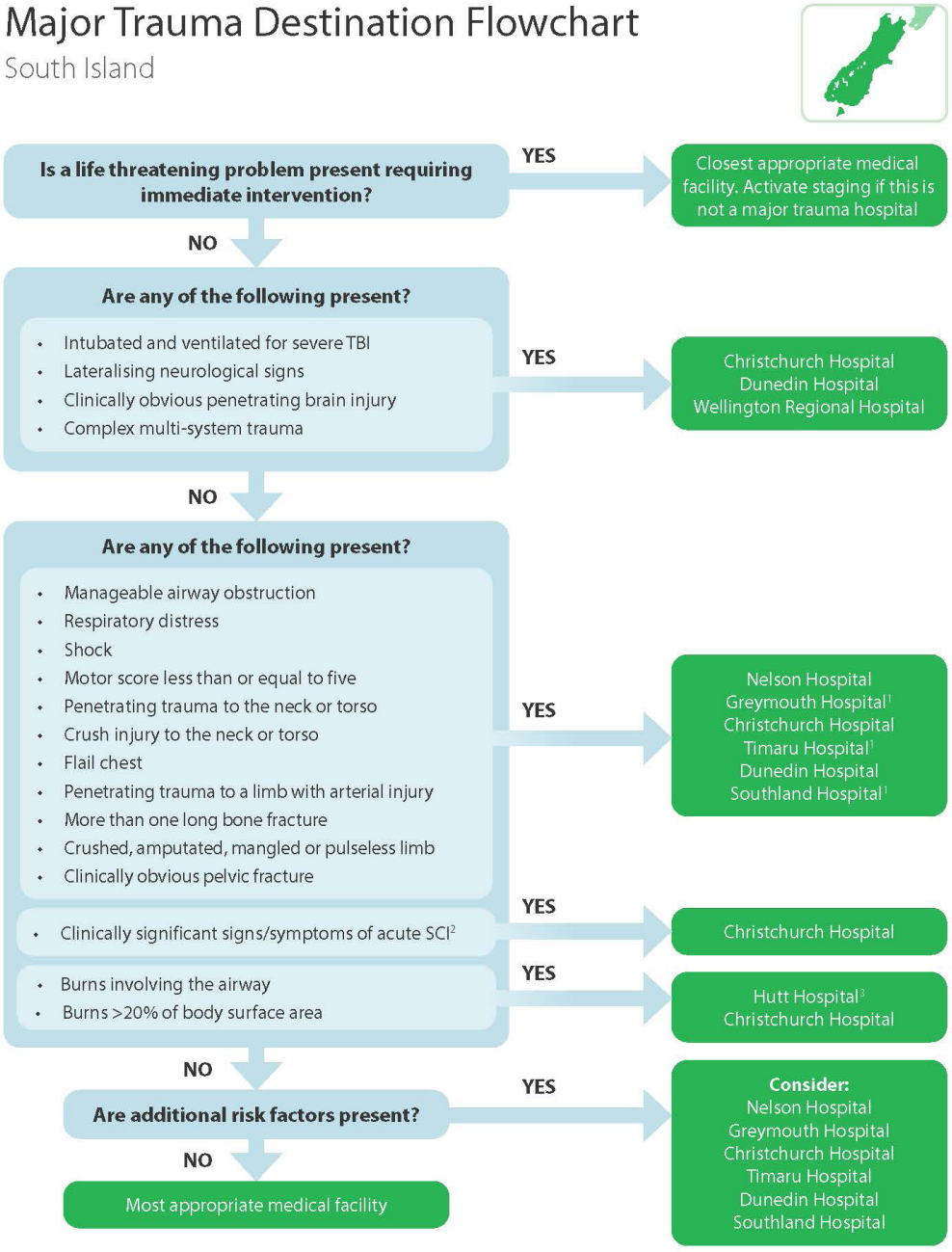
New Zealand Out-of-Hospital Major Trauma Destination Policy

South Island

This document is for the use of clinical personnel when determining the destination hospital for patients with major trauma in the out-of-hospital setting in the South Island of New Zealand. It has been developed by the South Island Trauma Workstream in conjunction with the National Major Trauma Clinical Network and the Ambulance Sector.

Publication date October 2020

Appendix 5 (continued): New Zealand out-of-hospital major trauma destination policy—South Island



Appendix 5 (continued): New Zealand out-of-hospital major trauma destination policy—South Island

Major Trauma Destination Policy: South Island

Additional Information

Introduction

- This policy is for the use of personnel in the out-of-hospital setting, when determining the transport destination for patients with major trauma in the South Island of New Zealand.
- It should be read in conjunction with the New Zealand Out-of-Hospital Major Trauma Triage Policy, the National Major Trauma Network Staging Guidelines, the New Zealand Spinal Cord Injury Destination Policy and the Ambulance Sector Clinical Procedures and Guidelines (CPGs).
- The goal of this policy is to ensure that patients with major trauma are transported directly to the most appropriate major trauma hospital, whenever it is feasible and safe to do so.

Major trauma hospitals

- The following hospitals are designated to receive patients with major trauma:
  - Nelson Hospital.
  - Greymouth Hospital[1].
  - Christchurch Hospital.
  - Timaru Hospital[1].
  - Dunedin Hospital.
  - Southland Hospital[1].
  - Wellington Regional Hospital.

  [1]**Note:** patients with major trauma will only be transported to Greymouth Hospital, Timaru Hospital and Southland Hospital by road. All patients with major trauma in the catchment areas of these hospitals being transported by helicopter will be transported to Christchurch Hospital, Dunedin Hospital or Nelson Hospital, provided it is feasible and safe to do so.
- The following hospitals are tertiary major trauma hospitals:
  - Christchurch Hospital.
  - Dunedin Hospital.
  - Wellington Regional Hospital.

Determining the most appropriate major trauma hospital

- The flowchart describes the preferred major trauma hospital/s, based on the best descriptor of the patient's clinical condition.
- The patient should be transported to the preferred major trauma hospital as described in the flowchart, whenever it is feasible and safe to do so.
- If it is not feasible or safe to transport the patient to the preferred major trauma hospital or more than one major trauma hospital is listed as an option, the patient should be transported to the most appropriate major trauma hospital. This will usually be the nearest major trauma hospital, but it may be appropriate to transport the patient to another major trauma hospital if that hospital has the most appropriate facilities to meet the patient's needs.

Appendix 5 (continued): New Zealand out-of-hospital major trauma destination policy—South Island

- Personnel will determine the most appropriate major trauma hospital taking into account all of the following:
  - The information within this policy.
  - The patient's expected treatment requirements.
  - The transport time to the relevant hospitals.
- Personnel should have a low threshold for seeking clinical advice if the transport time to the chosen major trauma hospital is significantly longer (this is not defined and requires clinical judgement) than the transport time to the nearest major trauma hospital.

Life threatening problems requiring immediate medical intervention

- Transport the patient to the closest appropriate medical facility if the patient has a life-threatening problem requiring immediate intervention that cannot be provided by personnel at the scene.
- The decision to transport a patient with a life-threatening problem to a medical facility that is not a major trauma hospital requires clinical judgement and must have a low threshold for seeking clinical advice. The decision should take into account the nature of the patient's injuries, the rate of deterioration, the relative proximity of the medical facilities and the personnel available at the medical facility.
- Staging must be activated via Comms, preferably before leaving the scene, if the medical facility is not a major trauma hospital.
- Personnel in the receiving medical facility must be notified as soon as possible, preferably before leaving the scene.

Severe traumatic brain injury (TBI)

- Most patients with severe TBI do not require urgent neurosurgery. However, patients with any of the following clinical features have a high probability of requiring urgent neurosurgery and/or neuro-intensive care and should be transported to Christchurch Hospital, Dunedin Hospital or Wellington Regional Hospital whenever it is feasible and safe to do so:
  - Intubated and ventilated **or**
  - Lateralising neurological signs, for example unilateral pupil dilatation or unilateral weakness **or**
  - Clinically obvious penetrating brain injury.
- Personnel should have a low threshold for seeking clinical advice if transport to Christchurch Hospital, Dunedin Hospital or Wellington Regional Hospital will involve a long flight, particularly if the patient is not intubated and ventilated.

Complex multi-system trauma

- Complex multi-system trauma cannot be tightly defined and clinical judgement is required, but includes patients with major trauma involving very severe injuries to more than one body region.
- Patients with complex multi-system trauma will usually benefit from transport to Christchurch Hospital, Dunedin Hospital or Wellington Regional Hospital, provided this is feasible and safe.
- Personnel should seek clinical advice prior to commencing transport, if transport to Christchurch Hospital, Dunedin Hospital or Wellington Regional Hospital will involve a prolonged flight.

Appendix 5 (continued): New Zealand out-of-hospital major trauma destination policy—South Island

Burns

- Patients with a burn injury of greater than 20% of TBSA or burns involving the airway should be transported to Christchurch Hospital or Hutt Hospital, if feasible and safe. Hutt Hospital is not a major trauma hospital and if there are signs or symptoms of major trauma in addition to the burn injury, the patient must be transported to a major trauma hospital.
- Patients with a burn injury greater than 10% of TBSA in an adult or greater than 5% of TBSA in a child should be transported to Christchurch Hospital or Hutt Hospital, or to a hospital with surgical facilities.
- Burns involving the face, hands or genitals may require treatment in a regional burn centre. However, provided the burn injury is less than 10% of TBSA in an adult or less than 5% of TBSA in a child, treatment is not usually time sensitive and the patient should usually be transported to the most appropriate hospital, and subsequently transferred if required.

Major trauma hospitals outside the South Island

- It may be occasionally appropriate for the patient to be flown to a hospital outside the South Island. For example, in the northern aspect of the South Island it may be appropriate for the patient to be flown to:
  - Wellington Regional Hospital if the patient has severe TBI or complex multi-system trauma or
  - Hutt Hospital if the patient has burn injury greater than 20% of TBSA or burns involving the airway.
- Personnel should have a low threshold for seeking clinical advice if a patient is being flown outside the South Island.