

TOURNIQUET MANAGEMENT

A Complicated and Uncommon Task

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SITUATION

- Trauma Case reviews highlighted a need for support
- Application of a TQ well understood. Conversion considerations not so much.
- Reluctance/Discomfort to convert TQ
- Transport times significantly impacts outcomes



BACKGROUND

- Tourniquet (TQ) application teaching is common
- Tourniquet conversion less so
- Increase in TQ use by EMS, RCMP, civilians...
- We recognized the need for a regionally endorsed Physician tool (even provincially)



ASSESSMENT

- Literature review of articles within the last 5 years was performed.
- Dr. Jerome performed a review of resources and summarized his findings in a regional rounds presentation in June 2024. [Tourniquet Use and Complications - June 13, 2024.mp4](#)
- Two clear outcomes:
 - Tourniquets save lives in vascular injury resulting in exsanguination
 - Timely conversion to another hemostatic adjunct and/or surgical repair is imperative for overall survival and to salvage the limb
- Combined resource recommendations within the following categories:
 - Time to TQ conversion
 - Contraindications to conversion attempts
 - Supportive interventions/adjuncts
 - Sequelae



RECOMMENDATION

Develop a Physician tool to support Tourniquet management (especially conversion)



RECOMMENDATION

- **Tourniquet Time (TT)** equals total time from TQ application to time of assessment.
- **TQ conversion** is the process of exchanging the tourniquet for another effective form of hemorrhage control i.e.) pressure, packing, and/or hemostatic agents or gauze.
- **Consult the Trauma Team Lead (TTL) via PTN for patients that require a TQ to control ongoing hemorrhage.**
- Low risk conversions have TT less than 2hrs. High risk conversions have greater than 2hrs TT.
- Conversion for TT greater than 6hrs are not attempted outside a tertiary center due to mortality risk and non-reversible limb ischemia.
- Conversion is part of a secondary survey/post resuscitation phase of care and not to be attempted prior to completion of a primary survey.
- **All patients with a TQ in place on arrival to an Emergency department need rapid assessment for placement, necessity, and effectiveness**



- All patients with a Tourniquet (TQ) in place on arrival to an Emergency Department need rapid assessment for placement, necessity, and effectiveness.
- Tourniquet Time (TT) eq
- Consult the Trauma Tear

Less than 2hrs TT

Contraindications:

- Traumatic Amputal proximally to the am
- Decompensated st
- Inability to closely for signs of shock

Complete High Risk

Conversion

1. Place secondary TQ proximal to the wound and leave secondary TQ loose.
2. Slowly release primary TQ (over 1 min) and observe wound for signs of bleeding.
3. Bleeding observed?

NO

- Consider Imaging/Angiography
- Distal Pulse Check

YES

1. Apply direct digital pressure
2. Pack wound with hemostatic gauze while maintaining pressure. (video reference <https://combatmedicine101.com/wound-packing/>)
3. Continue to apply pressure for at least 5 min
4. Apply pressure dressing over packing
5. Bleeding Observed?

NO

- Monitor patient
- Monitor wound
- Continue with transfer via PTN if appropriate

YES

- Re-tighten primary TQ as close to the wound as possible (4 cm proximal to wound)
- If bleeding continues, tighten secondary TQ
- Inform TTL and continue to prepare for LLTO transfer.

Pre-Procedure Considerations:



TOURNIQUET CONVERSION PHYSICIAN TOOL
Trauma Services Network

Pre-Procedure Considerations:

- This attempt at conversion is part of a secondary survey/post resuscitation phase of care and not to be attempted prior to completion of a primary survey and life saving interventions.
- Ensure safety of environment and sufficient resources, ensure additional tourniquet is available in event that primary tourniquet malfunctions.
- **Expose wound entirely** – ensure constant visualization of the wound and adequate staff and equipment for monitoring of patient status, cardiac monitor, Q2MIN VSS, and blood availability.
- TQ should be placed as close to the wound as possible (4-7 cm/2-3 inches) and always ON BARE SKIN.
- TQ replacement/repositioning should follow same algorithm as conversion on page 1.

- Environment – ensure patient is appropriately warmed and with ongoing core temperature monitoring
 - Ensure adequate staff to monitor exposed wound for ongoing or recurrence of hemorrhage
- Elimination – monitor urine output and anticipate potential for Rhabdomyolysis and impaired renal function

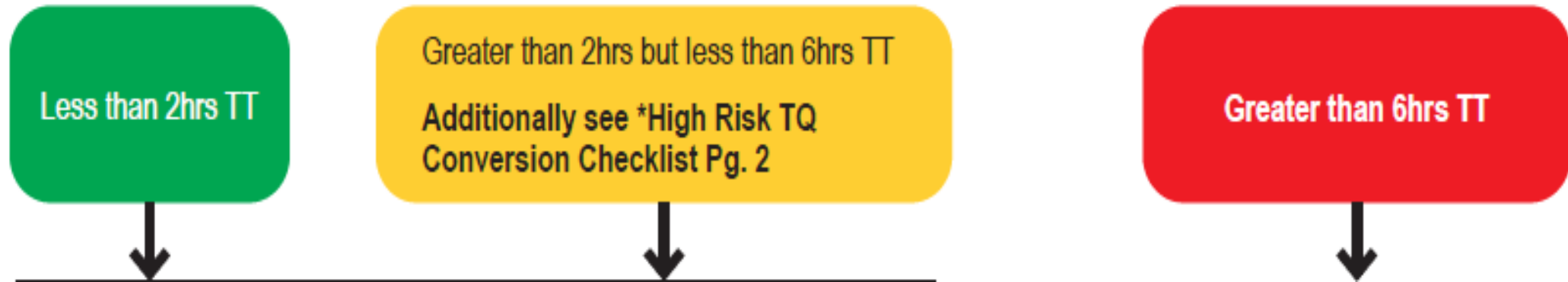
Checklist adapted from:

Weinrauch, P; Peters, N. The Reperfusion Toolbox. How to resuscitate a casualty in preparation for tourniquet removal after an extended duration of application. Nov 2023. Online

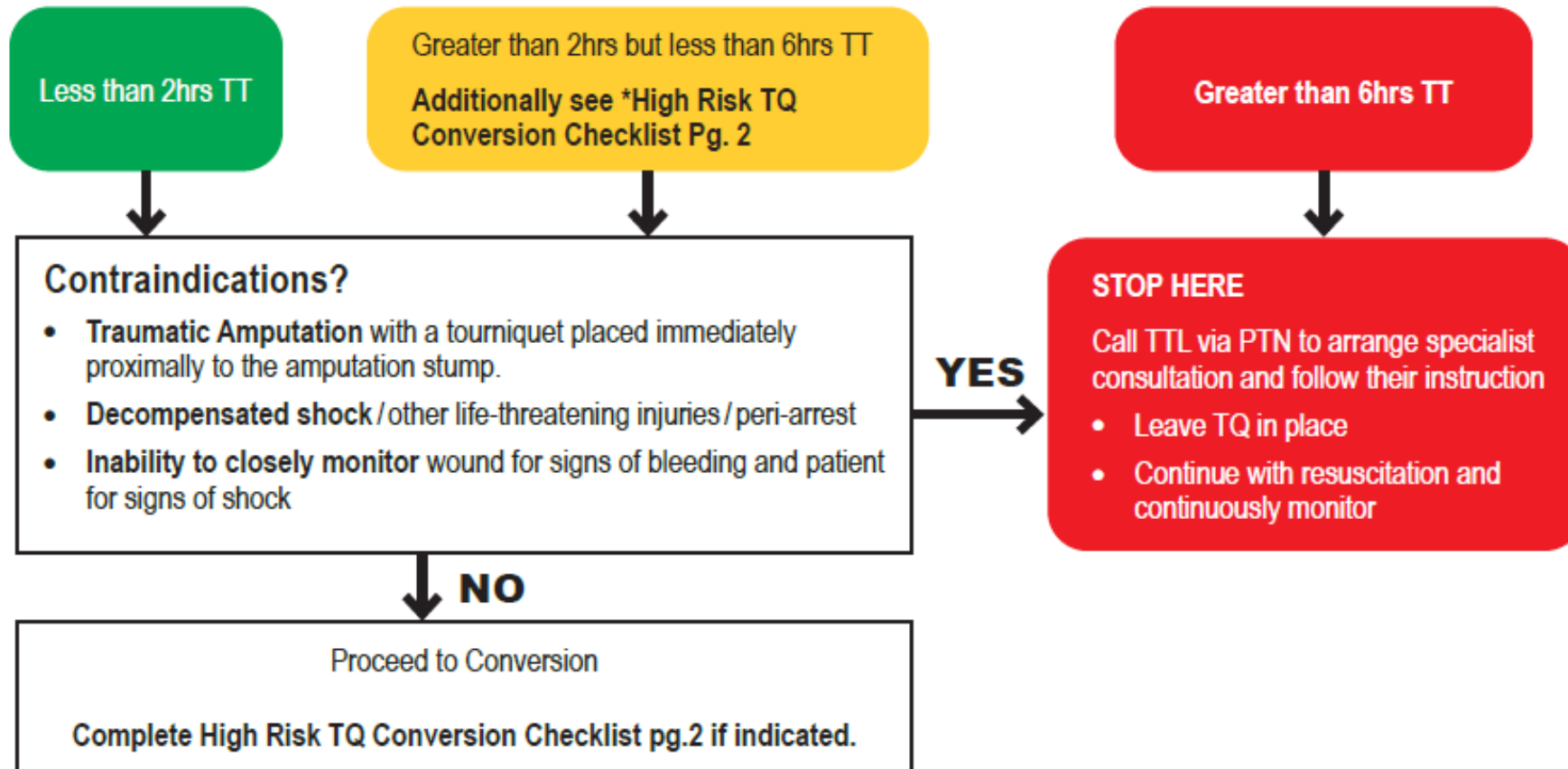
[The Reperfusion Toolbox: How to Resuscitate a Casualty in Preparation for Tourniquet Removal after an Extended Duration of Application | The Cove \(army.gov.au\)](https://www.army.mil/press-releases/2023/11/23/the-reperfusion-toolbox-how-to-resuscitate-a-casualty-in-preparation-for-tourniquet-removal-after-an-extended-duration-of-application/)

For complete list of references please email: traumaservicesnetwork@interiorhealth.ca

First step: Determine Tourniquet Time (TT)



Determine if Contraindications present:



*HIGH RISK (Between 2hr-6hrs TT) Tourniquet Conversion Pre-Procedure Checklist:

- Patients with prolonged (greater than 2hrs) TT are at risk for **reperfusion syndrome** which results in various forms of physiologic derangement.
- These include **Acidosis, Reperfusion Hypotension, Cardiac Arrhythmia, Hypothermia, and Acute Renal Injury**.

PRIOR TO RELEASE of the TQ it is imperative to optimize the following physiologic parameters to protect patients from the sequelae of reperfusion syndrome:

- A Correct Metabolic **Acidosis** and aim for mild **Alkalosis** prior to TQ release
- B Ensure adequate **Balanced** resuscitation, ideally with blood products, to a **Blood pressure** high enough to accommodate for hypotension that will occur with tourniquet release
- C **Calcium** – pre treat with calcium for cardio protection and correct iatrogenic hypocalcemia related to blood transfusion
Consultation – ensure TTL and appropriate subspecialty (Ortho, Vascular) aware of patient condition and rely on their guidance prior to attempting conversion
- D Place cardiac monitor AND **Defibrillation** pads on patient and anticipate hyperkalemic arrhythmias or need for cardioversion
- E **Electrolyte** imbalances-anticipate **HYPERkalemia**, attempt to shift K+ to low normal (3.5 as a target) prior to TQ release
 - **Environment** – ensure patient is appropriately warmed and with ongoing core temperature monitoring
 - Ensure adequate staff to monitor exposed wound for ongoing or recurrence of hemorrhage
 - **Elimination** – monitor urine output and anticipate potential for Rhabdomyolysis and impaired renal function

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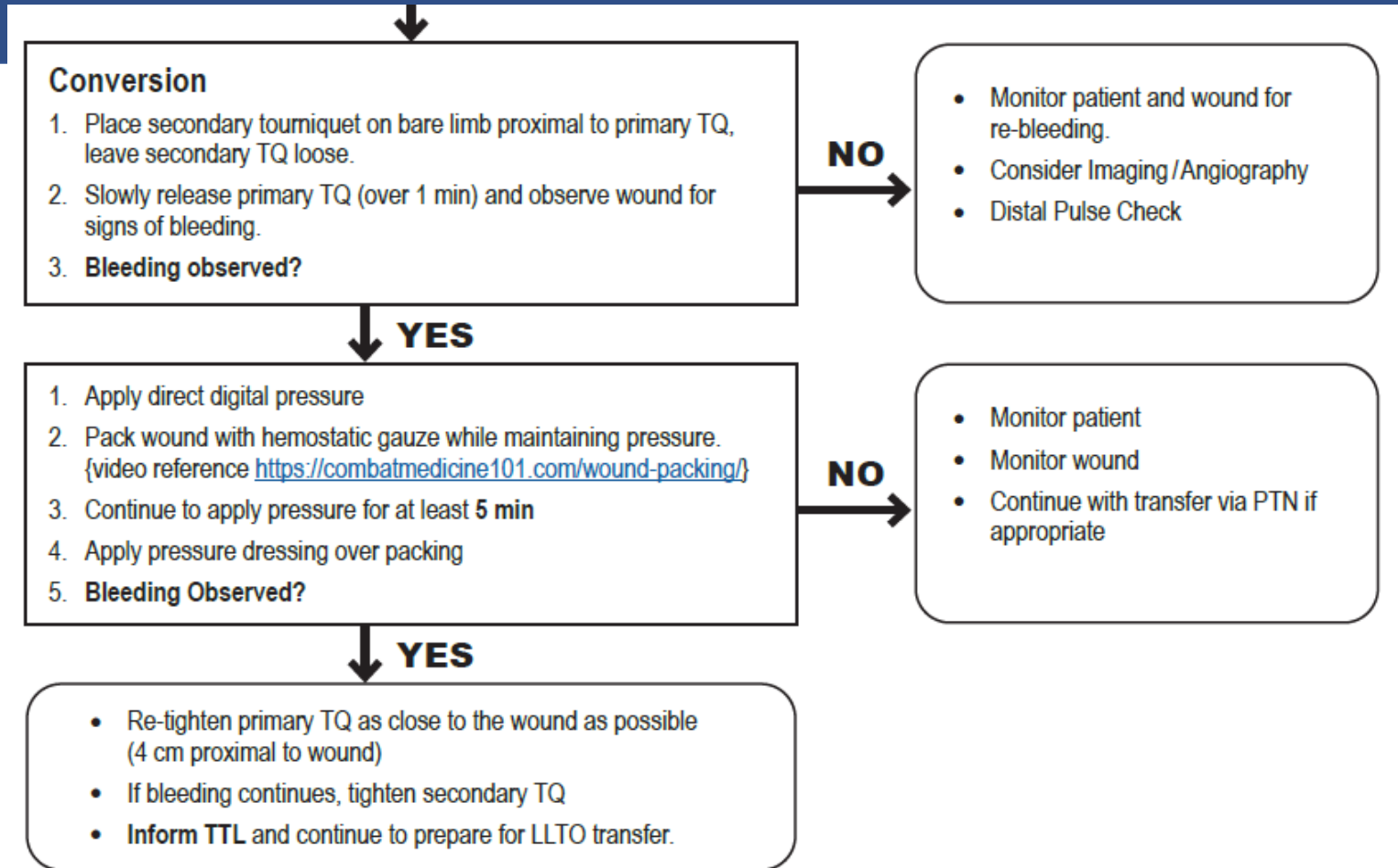
Weinrauch, P; Peters, N. The Reperfusion Toolbox. How to resuscitate a casualty in preparation for tourniquet removal after an extended duration of application. Nov 2023. Online

[The Reperfusion Toolbox: How to Resuscitate a Casualty in Preparation for Tourniquet Removal after an Extended Duration of Application | The Cove \(army.gov.au\)](#)

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If HIGH RISK:
Optimize the
patient's
physiology

Attempt Conversion: Follow the steps



Nuances...

- Venous Tourniquet
- Distal extremity tourniquet
- Thigh wounds
- Tourniquet replacement
- Packing technique
- Hemorrhage control kit



References

Australian Military Education Material:

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