Consensus Statement:
Pelvic Injury Management
November 2021

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PREAMBLE:

This update builds on the work of previous author teams and incorporates the latest research and expert opinion. We would like to thank everyone involved in the production of past and present versions of these articles for their hard work, diligence, and rigour in researching, writing and producing these valuable resources.

This document summarizes recommendations for the care of trauma patients who have suffered severe pelvic injury – in isolation or as part of a broader constellation of injuries. Recommendations are based on current best practice and are adapted from medical literature. It is recognized that the geography, population, and availability of specialized services in New Brunswick provide a unique context to be considered in any overall recommendations.

BACKGROUND:

1. Severe pelvic fractures are associated with high morbidity and mortality. The incidence of these fractures is more common in high-energy mechanisms, generally the result of motor vehicle collisions, motorcycle collisions, pedestrian struck by vehicle, and falls greater than 2 meters (1,2).

2. Hemodynamic instability can be due to haemorrhage from an unstable pelvic fracture, and/or associated intra-abdominal, chest or other injuries requiring the need for immediate interventions (1,2).

3. Although rare, low-energy mechanism in geriatric trauma patients, especially the frail elderly, can cause pelvic fractures that can result in massive haemorrhage, thus requiring treatment and/or transfusions (1,6,7).

4. Prehospital intervention with application of Pelvic Circumferential Compression Devices (PCCD) can reduce and immobilize unstable pelvic fractures (8,9,12,13,14).

5. All trauma patients with suspected or diagnosed major pelvic trauma should have PCCD applied prior to transfer to another trauma centre (1,3).

6. PCCD placed early (in prehospital and ED setting) when hemodynamic instability is present, provides effective early stabilization and external compression of severe pelvic trauma and reduction in need for transfusions, as well as reduced mortality and a reduction in length of hospital stays (2). PCCD reduces the shearing of vessels during transport, aiding in tamponade by reducing intrapelvic volume and pain (8).

7. Three retrospective studies on binder placement revealed pertinent findings on PCCD positioning. Of these, two retrospective reviews determined suboptimal PCCD placement both in prehospital and ED setting (9,13).
    i. The first review observed unsatisfactory positioning and not being applied in a large portion of pelvic ring injuries (9).
    ii. The second review studies trauma patients who arrived at the ED with PCCD and determined sub-optimal positioning with majority placed too high; females were at a greater risk for sub-optimal placement (13).
    iii. A third retrospective study concluded that many PCCDs are poorly placed and further education is recommended for clinical staff involved in the application of PCCDs (5).

8. Studies on hemodynamic status as a determinant of need for pre-hospital application of PCCD in adult trauma patients have concluded that normal haemodynamic status, combined with absence of major MOI, can rule out urgent pelvic application (8). Identification of factors, such as increased respiratory rate, prolonged capillary refill time and increased shock index has been completed to predict the presence of severe pelvic injury to improve PCCD placement (14).

9. PCCDs are considered safe due to their non-invasive nature and significant hazards associated with the use of PCCDs have not been reported previously (15). However, complications such as skin blisters and breakdowns on prolonged application have been reported in two case studies (1,2). Furthermore, misjudgement of the suitability of PCCD application for acetabular fracture could lead to serious complications of vessel injuries leading to hemodynamic deterioration (15).

10. Case reviews of pelvic fracture patients in New Brunswick have identified occasional interpretive discrepancy between orthopaedic and hemodynamic instability. Patients with unstable orthopaedic injuries, but who are hemodynamically stable, do not require urgent transfer to a pelvic surgeon. Those with pelvic fracture **and** hemodynamic instability require urgent transfer to a pelvic surgeon after stabilization attempts have been made locally (16).

RECOMMENDATIONS:

- Ambulance New Brunswick ensures that:
  - All new paramedics are trained in the use of a PCCD.
  - Annual PCCD retraining opportunities are provided, including competency evaluation.
  - Protocols related to PCCD use are created or updated.

- Use of the Kendrick Extrication Device (KED) for stabilization of pelvic fractures is not recommended.

- The PCCD should be considered in the immediate resuscitation phase of care for all patients with suspected major pelvic trauma within the Emergency Department, if not already applied by paramedics.

- All New Brunswick trauma centres (Levels I – V) should have immediate access to a PCCD, together with staff trained in its use, to achieve rapid pelvic ring fracture stability within the Emergency Department setting.

- If a PCCD is already in place upon arrival in the Emergency Department, it should not be removed to reassess pelvic stability, but only temporarily loosened to reposition when necessary. Temporary removal of the PCCD is only warranted to ensure adequate external bleeding control from wounds under the PCCD.

- PCCD use should be limited to 24-48 hours. Prolonged use and any application outside of the prehospital and emergency phases of care should be overseen by an orthopaedic surgeon. Risk of complications such as skin necrosis and pressure ulcerations increase with continuous application (16).

- If continued use is suggested by an Orthopaedic surgeon, pelvic binders should be released every 12 hours to check skin integrity and provide wound care as required (17). Documentation of all manipulation of the PCCD should be noted in the patient record.

Early application in Prehospital setting:

- Prehospital assessment of pelvis should consider mechanism of injury (MOI), in accordance with Step 3 of the current Field Trauma Triage Guidelines
- In addition, assessment of the pelvis should include asking the patient if they have pain on gentle palpation to the pelvic area, the hip or groin region, in the lower abdomen or back or if they have numbness and tingling to lower extremities
- Paramedics should also look for abrasions or bruising to pelvic region and compare limb length. By using the palm of hands, apply gentle medial and downward pressure on the iliac crests, as well as gentle pressure on the symphysis pubis. If there is instability, crepitus, movement of the normally stable bones of the pelvis, or if the patient complains of pain when pressure is applied, suspect a pelvic fracture and consider applying a PCCD.
- If GCS is reduced or distracting injuries are present, avoid palpation of the pelvis and consider immediate application of a PCCD.
- Minimal movement is recommended, therefore do not logroll the patient and follow local protocols for spinal motion restriction during transport. The use of a scoop stretcher is highly recommended.
- Paramedics record application date, time, and sign the PCCD upon application of the device.
- If patient is hypotensive with suspected bleeding and source of bleeding is not apparent, then application of a PCCD is recommended until injuries can be determined at receiving facility.
- Stabilization of the pelvis can provide comfort and easier transport. If possible, apply the PCCD before extrication (18).
- Continuing education and yearly competency assessment on the correct application of PCCD in the prehospital setting is recommended.

Application or Continuation of PCCD in the Emergency Department

- Position of the PCCD should be checked on arrival and, if necessary, adjusted as necessary to ensure placement centred over the greater trochanters.
- If the PCCD is not in place prior to arrival at the Emergency Department and patient meets criteria for application noted above, the PCCD should be applied early in the resuscitative phase of Emergency Department care. It is not necessary to obtain radiological evidence prior to application of the PCCD.
- A patient suspected of major pelvic trauma requiring transfer to higher level of care should have PCCD applied prior to the transfer.
- Emergency Department nursing staff should review application of PCCD as an annual competency (consider https://www.youtube.com/watch?v=aCJWhdQ37Xc&t=9s)
- All Emergency Departments in NB should have a PCCD immediately available and accessible.

Contraindications

- The PCCD is contraindicated when there is an impaled object that would be covered by it.
- In a confirmed case of a lateral compression injury, early consultation with an Orthopaedic Surgeon is recommended, especially if continued use of PCCD may be required

Discontinuation

- If a PCCD is already in place upon arrival in the Emergency Department, the pelvic binder should not be removed for the purposes of reassessing pelvic stability but only to reposition when correct alignment is necessary. Temporary removal of the pelvic binder is only warranted to ensure adequate external bleeding control from wounds under the binder.
- Discontinuation of the PCCD may only be directed by the attending physician or orthopaedic surgeon.

Trauma NB

- Provides continuing data collection of both prehospital and ED application of PCCD within the Trauma NB Registry
- Provides quality improvement (QI) process feedback on the application of PCCD in Emergency Department and collaborates with ANB on related education/QI processes for Paramedics.

Special patient populations:

- For all patients weighing less than 23 kg (50 lb), use of a sheet instead of commercial devices is recommended.
- For paediatric/small adult patients weighing more than 23 kg (50 lbs), PCCDs can be cut to length during application to provide the necessary midline gap.
- For pregnant patients, PCCD remains safe and appropriate to use, as long as the landmarks for application can be identified.
- For bariatric patients, two PCCDs can be joined together to create a larger binder
- Geriatric trauma patients should have high index of suspicion for pelvic fractures, even with low energy mechanisms of injury.

GRADE Level of Evidence: Level B - Recommendation

- Generally, clinicians should follow the recommendations but should remain alert to new information and sensitive to patient preferences

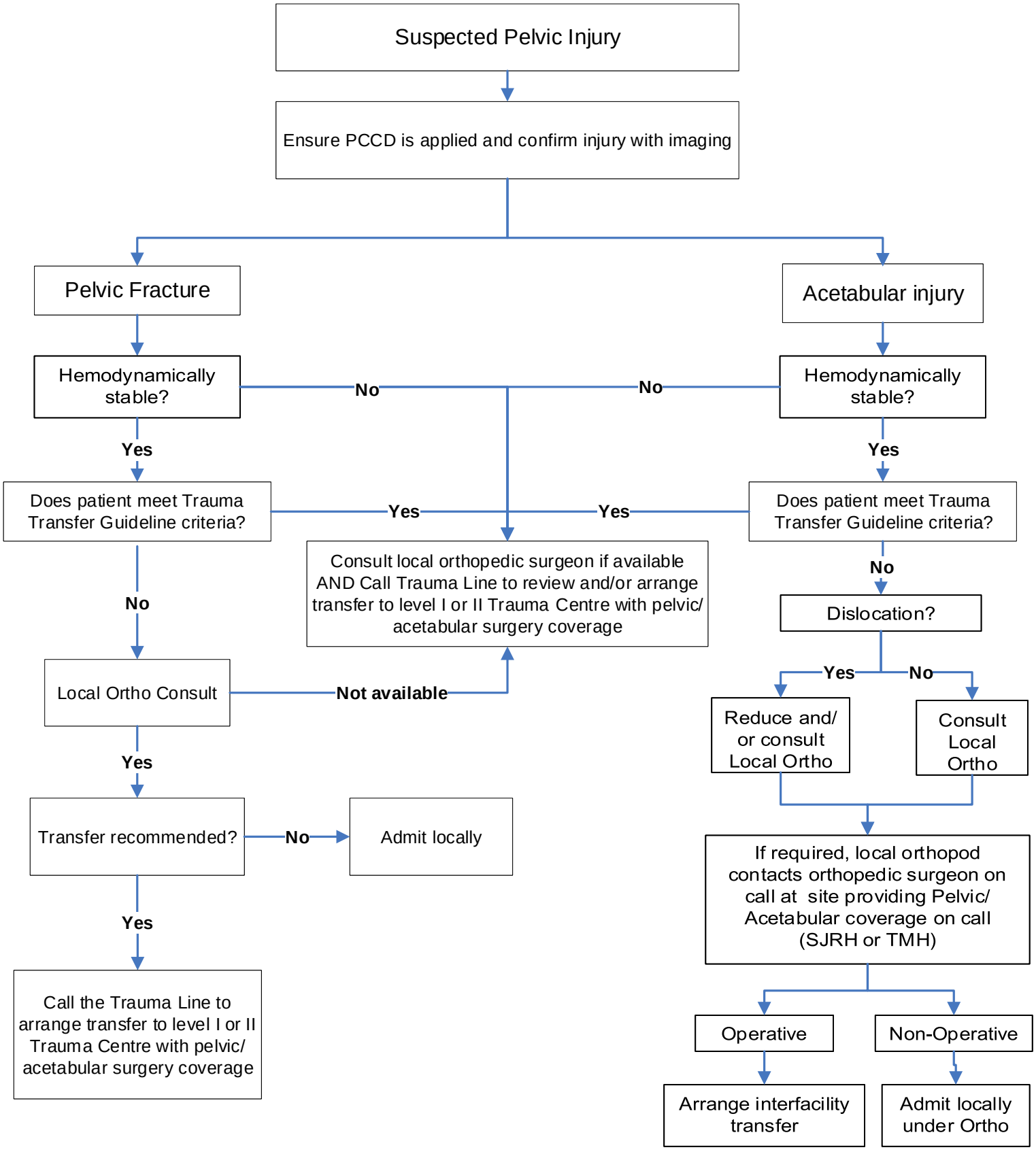
Appendix A

Clinical Guidance Summary:
Pelvic and Acetabular Injuries

Trauma NB

Appendix A
Clinical Guidance Summary: Pelvic and Acetabular Injuries

November 2021



With a PCCD or external fixation, most hemodynamically stable patients with pelvic fractures can safely remain at a level III trauma centre with local orthopedics capability until definitive surgical care is planned.

Appendix B

Pelvic Circumferential Compression Devices (PCCD)– FAQ

Pelvic Circumferential Compression Devices (PCCD)– FAQ

Date: November 1, 2021	Version: 2.0
Reference: Trauma NB Consensus Statement Pelvic Injury Management	

PCCD

The circumferential compression obtained from a PCCD provides early stabilization for the hemodynamically unstable patient who has suspected or confirmed unstable pelvic fracture. Stabilization of pelvis reduces pelvic volume which tamponades bleeding. It also reduces fracture movement, which reduces pain and helps reduce the risk of shearing major blood vessels during transport.

What are the indications for PCCD?

Hemodynamically unstable patients with a suspected or confirmed pelvic fracture.

When is a PCCD contraindicated?

The PCCD is contraindicated when there is an impaled object that would be covered by it. In cases where the patient may have both fractured femur(s) and pelvic instability, the immobilization of the pelvis should be completed before immobilization of the femur(s), keeping in mind that traction splints interfere with use of the PCCD – using standard immobilization of lower extremities is recommended in these cases.

What are the implications for using a PCCD on a patient who is visibly pregnant?

As long as the landmarks for application can be identified, it is safe to use the PCCD.

What equipment is available to bind the pelvis?

Ambulance New Brunswick and all NB Emergency Departments use the PCCD Responder device. If PCCD is not immediately available, a simple sheet can be used to bind the pelvis but must be applied by two people and securely fastened.

Who can apply a PCCD or Sheet?

Paramedics have received education and have PCCDs in all ANB vehicles as of June 2016 and may apply the device to any qualifying prehospital patient. Nurses have been provided education and practice with PCCDS via Trauma NB. If further education is required, please contact your Trauma NB Resource Nurse at your respective site. For nurses, a physician must order the application of the PCCD or pelvic sheet. Ensure the order is written and name of physician ordering is documented.

When should a urinary catheter be inserted?

The potential need for urinary (Foley) catheter insertion does not influence the paramedic decision to apply a PCCD for qualifying prehospital patients. When patients require application of a PCCD in the emergency department, a Foley catheter should be inserted prior to application. Prior to insertion, assessment for blood at urinary meatus or other signs of urethral or bladder injury must be communicated to the attending physician. If Foley catheter is contraindicated due to blood at meatus or due to urethral or bladder injury, the PCCD should be applied and the ED physician should request an immediate consult to local Urology. If Urology is not available locally, consultation with the Trauma Control Physician via the Toll Free Trauma Referral System is recommended.

What are the key nursing responsibilities if a patient arrived in the Emergency Department with a PCCD that has been placed by paramedics?

1. Ensure date and time of application of binder, documented on binder or sheet and initialed by paramedic.
2. Ask the paramedic if there were any underlying injuries noted beneath binder prior to application.
3. If applied over clothing, ask paramedic if pockets were checked and emptied prior to application of binder.

What are the key nursing responsibilities when a patient arrives from another Emergency Department or site/nursing unit with a PCCD or Sheet binder in place?

1. Ensure date and time of application is documented on binder including initials.
2. Ask transfer personnel if binder has been in place greater than 12 hours. If it has, confirm if and when the binder has been released to check skin integrity. If the binder has been placed for more than 12 hours and no check of skin integrity has been completed, consultation with orthopedic surgery is recommended. If orthopedic surgery is not available, consultation with the Trauma Control Physician via the Toll Free Trauma Referral System is recommended.

Should a PCCD or Sheet binder be released immediately on arrival to an ED/nursing unit for the purposes of reassessing pelvic stability?

No. The PCCD should only be released if an orthopedic surgeon is immediately present and requests reassessment of the pelvis. Temporary release of binder is also warranted, under the direct supervision of a physician, to ensure adequate external bleeding control from a wound under the PCCD and/or to facilitate patient exposure and ongoing assessment. In either case, document on the binder the time/date/initials of when the binder was released. Also document on patient record including how long in minutes the release occurred and the patient response to the temporary release.

What documentation is required when the PCCD is discontinued?

After confirmation of a written discontinuation order, the nurse must document date and time of PCCD removal, patient's response, complete set of vital signs and assessment of skin integrity of pelvic region.

How do I apply a PCCD?

There are educational resources available online at https://www.youtube.com/watch?v=aCJWhdQ37Xc&t=9s

How do I apply a Pelvic Sheet? Two good references are:

https://www.youtube.com/watch?v=K45pODWw534
https://www.youtube.com/watch?v=FieMnAze4s8

Is the PCCD safe in x-ray machines, i.e. CT scan, MRI?

Yes, PCCD is completely radiolucent.

What do I do if patient is too large for a PCCD?

For bariatric patients, two PCCD devices can be joined together to create an extra-large binder. Two PCCDs can be affixed together by using one of the Velcro backed power unit to secure the two units together and using the other Velcro backed power unit to tighten the binder.

What do I use for the small adult population?

The PCCD should be cut to fit patient with the appropriate midline gap of (6-8 inches) 15-20 cm.

What do I do for the paediatric population that weigh less than 23 kg (50 lbs.)?

Patients weighing less than 23 kg (50 lbs.) should have a sheet applied instead of PCCD.

When should I document in patient record on PCCD or Sheet Binder?

Documentation in the patient record on PCCD or Sheet Binder should occur when binder is applied and should include:

- Who applied binder, date, and time.
- Any release of binder for assessment of skin integrity and length of time released.
- Removal of binder – by whom, date, time, and skin integrity, post removal.
- Documentation of neurovascular status of lower limbs prior to application and after binder is in place and at regular intervals if binder is in place more than 12 hours.

How often should the binder be released to check skin integrity?

The binder should be released every 12 hours to check for skin breakdown, under the direct supervision of the attending physician.

How long will PCCD be in place?

The PCCD will remain in place until it has been determined that the pelvis is not the source of bleeding and fracture is stable or until patient is taken to the operating room or to interventional radiology for either definitive repair or application of an external fixator. In some cases, the PCCD may be left on in a sending facility, pending transfer to a centre where definitive repair will be completed.

Who are the Orthopedic Surgeons that specialize in repair of complex pelvic fractures?

Dr. James Wagg (SJRH) and Dr. Abdallah Husseini (TMH) are currently the Orthopedic surgeons who have fellowship training to repair complex pelvic fractures. However, all orthopedic surgeons are capable of assessing, guiding initial management and assisting with stabilization in the acute care phase. Trauma NB maintains up-to-date coverage availability for the definitive repair of complex pelvis fractures, allowing Trauma Control Physicians to make sure that transfers are organized to the best possible destination when required.

When is transfer for definitive repair of complex pelvic fractures required?

It depends! Patient with ongoing hemodynamic instability (those who have hypotension and/or need blood products to support a safe blood pressure) as a result of an unstable pelvic fracture do require emergent transfer to a centre capable of either embolizing the bleeding blood vessels and/or completing the definitive orthopedic repair. In some cases, Trauma Control Physicians may consult with local general surgeons, if damage control surgery is felt to be important prior to transfer.

However, complex pelvic fracture patients who are hemodynamically stable do not require immediate transfer for definitive repair. If their injury is isolated to the pelvis, their transfer can be arranged for the following day or at a later date. An early call to the Toll Free Trauma Referral System during the Emergency Department phase of care is always encouraged to discuss the plan for transfer with the Trauma Control Physician.