

Title: A critical analysis of the accuracy and specificity of physical assessment in detecting pelvic fracture.

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Can physical assessment in the prehospital setting accurately detect pelvic fractures?

Clinical Scenario: You are dispatched Code 1 to a horse-and-rider accident, where a 26-year-old female has been found unconscious. On examination of the patient, the paramedics develop a high index of suspicion that in addition to other injuries, a pelvic fracture has occurred, which now deems the patient at high risk of internal bleeding and haemodynamic instability. This patient requires rapid and effective assessment of injuries, interventions, and transportation.

PICO (Population – Intervention – Control – Outcome) Question: When assessing pre-hospital patients with traumatic pelvic injury, will a physical assessment of the pelvis accurately detect the presence of pelvic fracture to ensure efficacious interventions and therapies are implemented?

Search Rationale: The majority of pelvic fractures result from high-energy blunt force trauma and potentiate severe compromise of haemodynamic stability. For this reason, early diagnosis and treatment is essential to optimise patient outcomes and reduce mortality rates. Pelvic fracture diagnosis within the prehospital setting was initiated into the primary trauma survey in 1980 and includes the inspection of deformities and palpation of the pelvis to assess stability. But does physical assessment accurately detect pelvic instability in a prehospital setting and are there any factors that affect this?

Search Strategy:

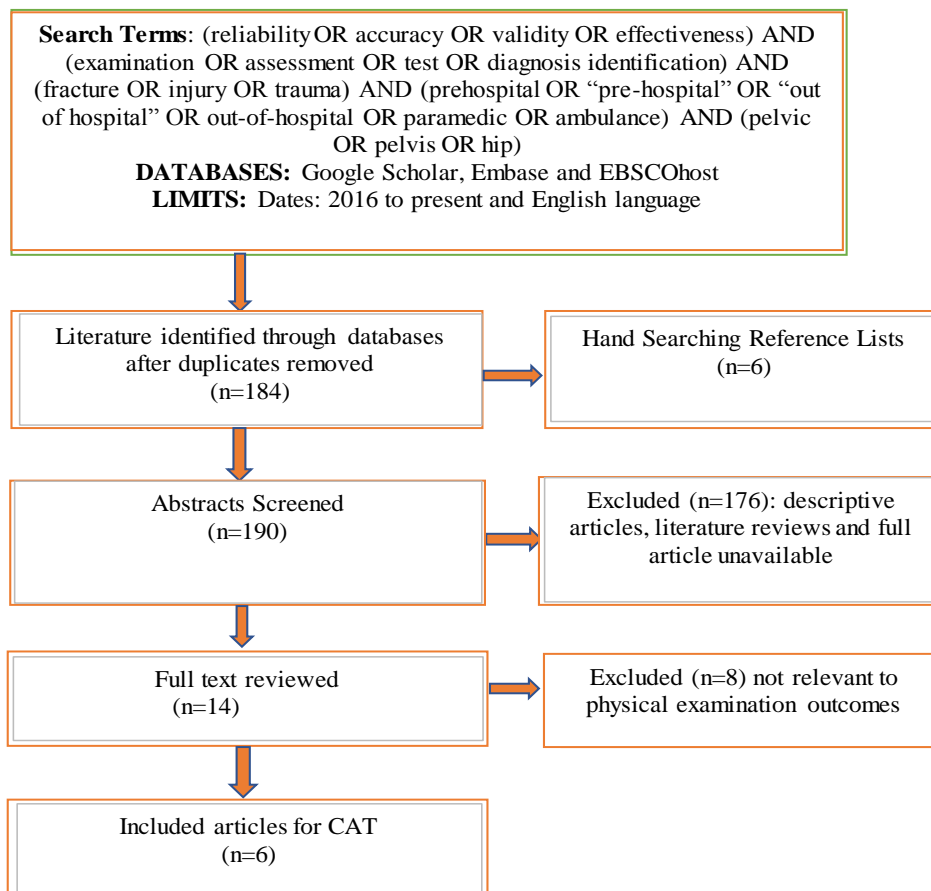


Figure 1: PRISMA Flow Chart Showing Search Strategy

Search Results:

AUTHOR, YEAR	POPULATION: SAMPLE CHARACTERISTICS	DESIGN: LOE	AIMS:	RESULTS	STRENGTHS/ WEAKNESSES
van Leent et al. (2019)	May 2015-Dec 2016. 56 patients (mean age = 49) age \leq 18 and indicated radiologic examination of pelvis from high energy blunt trauma with injury score > 16	Prospective observational questionnaire study. Level II	The study aims to establish the diagnostic accuracy of the prehospital clinical examination of the pelvic ring guiding for intervention with a pelvic binder	Of 56 patients, 11 had pelvic ring fractures. A positive manual compression test was seen in 4 of these and a negative test in 7. This shows the reliability of on- scene MCT in determining PRF had a sensitivity of 0.30 and specificity of 0.95. The authors state that based on this study, the diagnosis of pelvic ring fracture by MCT in the prehospital phase is not reliable and potentially dangerous.	(+) heterogeneous population of different kinds of blunt trauma (-) small sample population (-) single centre trauma study (-) not all physicians filled in questionnaires

Schweigkofler et al. (2018)	24-month period. 254 patients with strong clinical suspicion of pelvic injury.	Prospective observational questionnaire study. Level II	The study aimed to analyse the diagnostic accuracy of physical examination and early pre-treatment with pelvic binder application in prehospital and emergency settings.	Manual examination of pelvic stability was performed in 156/254 patients (61.4%) with 25 of these (16%) returning a positive manual examination for PF. Of these, 18/25 were confirmed through CT scans, yielding a sensitivity of 31.6% and specificity of 92.2%. The author revealed that 68.4% of all unstable PFs were missed during clinical examination with 46 patients being misdiagnosed. As such the author states that if manual examination was the only form of diagnosis, 2/3 of the patients with PF would have been missed. They further state that the application of external compression devices did not show adverse effects even when applied unnecessarily.	(+) Multi-centre large population study (-) Lack of differentiation between prehospital and emergency room manual examination
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Okada et al. (2020)	2644 cases reviewed investigating 49,043 patients of which 8300 were determined to have PF.	Systematic Review & Meta Analysis. Level I.	To assess the diagnostic accuracy and clinical utility of physical examination in blunt trauma patients with PFs.	Pooled sensitivity of physical examination of PF was 86% at a given specificity of 0.92. The study further revealed the pooled sensitivity in a subgroup of patients with GCS \geq 13 was higher than that of patients with impaired consciousness. From the results, the authors concluded that while physical examination is useful as a screening tool, the clinical utility of physical examination for detecting PF will not only depend on patients' consciousness, but also the situational setting and resources available.	<ul style="list-style-type: none"> (+) Study is based upon a comprehensive literature search (+) study included diverse patient heterogeneity (-) potentially missed studies (-) some studies inadequately reported findings (-) most studies set within emergency department make generalisation of findings in other settings unclear
Lustenberger et al. (2016)	11,062 patients evaluated with 7,201 patients included by primary admission, blunt mechanism of trauma, injury severity score \geq 9 and suspected prehospital pelvic injury. Mean age: 42.7	Retrospective Observational Study. Level II	To understand the reliability of the out-of-hospital evaluation and physical examination of the pelvis to rule out significant injury in blunt trauma patients.	A 55.9% sensitivity (4023 patients) was determined for pre-clinical physical examination detecting PF. 44.1% of patients (3178) with confirmed PF were not preclinically detected with PF. The authors stated that trauma patients who had missed pre-clinical diagnosis from physical examinations were more likely to have diminished conscious states and be intubated at the scene and further stated that all patients with suspected PFs should have imaging tests performed as a gold standard for PF diagnosis.	<ul style="list-style-type: none"> (+) multicentre, large population study (-) retrospective nature and data accrual and analysis (-) non-standardised physical examination by pre-hospital physicians

Bolt et al. (2018)	328 patients with blunt mechanism of injury, GCS ≥ 13 , aged 15 or older, no lower limb injuries, and investigated with pelvic Xray	Prospective observational study. Level I	To validate the hypothesis that painlessly utilising the muscles of hip flexion by SLR in the presence of pelvic injury will not be possible during the prehospital physical examination.	PF was confirmed in 35/328 patients (10.7%) with 32 of the 35 unable to perform a SLR. The remaining 3/35 who successfully performed a SLR were shown to have impaired GCS or opioids administered in the ambulance. From a subgroup of patients with GCS=15 and PF, 28/28 were not able to SLR without pain, giving a sensitivity of 100%. From these results, the authors determined that the SLR is a simple and effective physical assessment tool when diagnosing PF among awake, alert patients without lower limb or spinal injuries to aid in quick decision making when identifying a source of bleeding in trauma patients.	(-) single centre study (-) Xray comparison utilised instead of CT scan (-) non-blinded Xray results for physicians when testing SLR may allow for bias
Moosa et al. (2019)	Jan - June 2015. 133 patients comprised of alert and awake blunt-trauma patients aged 16 years or older with GCS = 15 and no evidence of haemodynamic instability. Mean age = 37.2	Cross-sectional prospective study. Level III	To determine the diagnostic accuracy of clinical examination in detecting PF in patients from blunt trauma.	The results showed a sensitivity for correct diagnosis with clinical examination compared to pelvic Xray of 87.5% and a specificity for no PF on physical examination of 88.03%. From these results, the positive predictor value was shown to be 50% while the negative predictor value was determined to be 98.09%. The authors concluded that lower positive predictor values may be due to the smaller sample size. Furthermore, the authors stated that a thorough	(-) assessment was made by surgical residents in a hospital setting (-) single centre study (-) no follow up after initial assessment

				clinical examination for patients with no impairment of consciousness, no other distracting injuries or complaint of pelvic pain along with negative clinical examination features can avoid unnecessary financial burdens with x-rays in resource-poor countries, without compromising patient quality of care. It was further stated that a thorough clinical examination can alleviate the need for Xray in the same way protocols like NEXUS alleviate the need for cervical Xray.	
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Abbreviations: PF: pelvic fracture; GCS: Glasgow Coma Scale; MCT: Manual Compression Test; NEXUS: National Emergency Xray Utilisation Study; CT: computed tomography.

Conclusions: The literature has demonstrated that physical examination of pelvic fractures yields low sensitivity and accuracy. Physical examination was defined as observation of bruising, haematoma, tenderness at iliac crests, tenderness at pubic symphysis and abnormal range of motion at hip joint. A number of factors impacted the accuracy of detection including patient GCS, distracting injuries and administration of pain relief. In the prehospital environment, the literature states that prompt extrication and CT scanning is the gold standard of pelvic fracture diagnosis. Future studies should focus on physical examination of the pelvis in prehospital paramedic attended treatments.

Consideration for Practice: Current state clinical guidelines stipulate the observation of clinical signs and symptoms when determining potentially life-threatening pelvic injuries. There is no inference to undertake manual assessment of the pelvis and guidelines further state that clinical assessment has a low sensitivity for diagnosing pelvic fractures (Queensland Ambulance Service, 2021). Based upon the research identifying the accuracy of physical assessment in a prehospital setting, the literature reinforces current guidelines and shows that manual assessment has low sensitivity and can potentially disrupt clot formation and haemodynamic stability.

Clinical Bottom Line: In the prehospital setting, paramedics should be wary of physically manipulating pelvic landmarks and opt for conservative observations and prophylactic interventions.

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