MACH
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Final reporting (Cohort 3)

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Project title: De-implementing Unnecessary Pelvic X-Rays During Initial Trauma Assessment in the Emergency Department

REPORT

Background: This single-centre mixed-methods study at the Royal Melbourne Hospital (RMH) evaluated whether routine pelvic x-rays performed during trauma team activations provided meaningful clinical value in the modern era of near-universal whole-body CT (WBCT) imaging. Although pelvic x-rays remained embedded in trauma protocols, advances in CT imaging had meant that many of the pelvic x-rays performed no longer influenced management, potentially exposing patients to unnecessary radiation, delaying care, and generating avoidable health-system costs.

Aim: The study aimed to determine the proportion of pelvic x-rays that delivered independent diagnostic value**,** defined as a pelvic x-ray that directly changed patient management prior to additional CT based imaging. It also sought to identify patient or clinical characteristics that predicted when a pelvic x-ray was useful, quantify the resource implications of performing the test, and explore clinician perspectives on reducing low-value imaging.

Methodology: A mixed-methods design was used. First, a retrospective chart review of RMH trauma team activations was undertaken to understand how often pelvic x-rays altered management and analyse associations with injury patterns, physiology, and presentation characteristics. Then, semi-structured interviews with emergency and trauma clinicians examined the acceptability of reducing pelvic x-ray use, guided by the Theoretical Framework of Acceptability to understand behavioural, cultural, and system influences on imaging decisions.

Results of the retrospective chart review: the retrospective cohort included 562 trauma team activation patients between July and December 2024, of whom 307 (55%) underwent a pelvic x-ray. The minority of pelvic x-rays provided independent diagnostic value: management was altered in 17% of cases, most frequently through pelvic binder removal (52% of management changes) or by triggering an orthopaedic referral (35%). CT trauma imaging was performed in 93% of cases, reinforcing that pelvic x-rays are rarely used at RMH for definitive decision-making regarding trauma care.

When reviewing the clinical characteristics of patients in whom pelvic x-rays provided independent diagnostic value, patients requiring blood products (Odds Ratio (OR) 2.8, Confidence Interval (CI) 1.4-5.7) and in those who had a pelvic binder applied (OR 7.7, CI 4.3-13.6) and those with clinical signs or symptoms of a pelvic injury (OR 3.5, CI 1.2-10.2) were more likely to have a pelvic x-ray that had diagnostic value. I used these characteristics to create the initial version (see Figure 1) of the pelvic x-ray ordering algorithm for RMH. For your interest I have also included the analyses arising from this work in Appendix 1.

Figure 1: Draft Pelvic X-ray Ordering Algorithm

[redacted]

Results of the semi-structured interviews: I undertook seventeen semi-structured interviews were undertaken with emergency physicians and trauma surgeons using the interview guide provided in Appendix 2.

Analysis using the Theoretical Acceptability (TFA) demonstrated overall high acceptability of de-implementing routine pelvic x-rays, with emergency physicians and trauma surgeons describing pelvic x-rays as having limited value with the rapid access to whole body CT at RMH.

Participants identified that pelvic x-rays retained value in specific high-risk scenarios, including haemodynamic instability indicating potential pelvic haemorrhage, or when imaging might guide an immediate disposition decision such as transfer to theatre. Routine imaging prior to CT in stable patients was viewed as redundant, particularly when it did not alter management or expedite definitive imaging. Many clinicians reported already adopting a selective imaging approach, reserving pelvic x-rays for cases where it would meaningfully influence early decision-making.

Despite participants being able to identify that pelvic x-rays rarely changed management, routine use persisted in many instances. Participants described imaging as frequently being initiated through pre-defined order sets in RMH's electronic medical record (EPIC). The hierarchy within the medical team, in addition to the inter-disciplinary team dynamics, also influenced behaviour. Participants felt that the trauma residents and registrars continued to order imaging to align with what was believed to be senior medical staff expectations, and emergency medical participants voiced that they did not question this to avoid conflict during time-critical resuscitations.

Operational considerations further shaped practice. Pelvic x-rays were sometimes used pragmatically as a reassurance tool when access to CT was delayed, to prioritise scanning, exclude the pelvis as a bleeding source, or justify removal of a pre-hospital pelvic binder. These uses reflected adaptation to system pressures rather than a belief in the diagnostic utility of the test.

Overall, the findings from these semi-structured interviews suggest that the ongoing use of pelvic x-ray relates to a cultural and systems-based factors rather than due to a lack of clinician agreement in reducing ordering. Participants indicated that reduction would be feasible if supported by a multidisciplinary consensus, targeted education, and a decision-support algorithm embedded within the trauma team activation process.

During these semi-structured interviews, I ensured that each participant had the opportunity to review the draft decision-making algorithm presented in Figure 1. After 11 iterations, the final agreed algorithm was determined (Figure 2).

Figure 2 – Final decision-making algorithm for pelvic x-ray ordering



Achievements:
I was able to present this work as an oral presentation at the Australasian College of Emergency Medicine's Annual Scientific Meeting in November 2025. It was well received and a number of individuals from a range of hospitals across Australia emailed me to request the algorithm for potential implementation at their own health services. I am currently in the process of writing up this manuscript for publication to ensure the results are publicly accessible and the findings of the project able to be considered for incorporation into future guidelines.

Next steps:
The next step in this project is to achieve multidisciplinary agreement on the use of this guideline at RMH, undertake education with emergency and trauma staff and implement it into practice. I will then conduct a post-implementation review to determine the impact that incorporating this guideline into practice has had on reducing unnecessary pelvic x-ray ordering at RMH.

Appendix 1: Quantitative Analyses
Table 1- Characteristics of eligible patients

	Did not have pelvic x-ray (N = 255) – N (%)	Had pelvic x-ray (N = 307) – N (%)	Total (N = 562) – N (%)
Type of trauma activation			
Trauma Alert	179 (70.2%)	180 (58.6%)	359 (63.9%)
Trauma Call	72 (28.2%)	127 (41.4%)	199 (35.4%)
Trauma Referral	4 (1.6%)	0 (0.0%)	4 (0.7%)
Potential injuries			
Evidence of head injury	134 (52.5%)	143 (46.6%)	277 (49.3%)
Cervical spine pain	36 (14.1%)	36 (11.7%)	72 (12.8%)
Thoracolumbar back pain	31 (12.2%)	48 (15.6%)	79 (14.1%)
Suspected spinal cord injury	8 (3.1%)	10 (3.3%)	18 (3.2%)
Suspected chest injury	77 (30.2%)	132 (43.0%)	209 (37.2%)
Suspected abdominal injury	50 (19.6%)	86 (28.0%)	136 (24.2%)
Pelvic pain	14 (5.5%)	71 (23.1%)	85 (15.1%)
Evidence of upper limb musculoskeletal injury	103 (40.4%)	166 (54.1%)	269 (47.9%)
Evidence of lower limb musculoskeletal injury	77 (30.2%)	171 (55.7%)	248 (44.1%)
Other	0 (0.0%)	1 (0.3%)	1 (0.2%)
None	10 (3.9%)	10 (3.3%)	20 (3.6%)
Unknown	0 (0.0%)	1 (0.3%)	1 (0.2%)
Was a CT trauma scan undertaken in the ED?			
No	33 (12.9%)	5 (1.6%)	38 (6.8%)
Yes	222 (87.1%)	302 (98.4%)	524 (93.2%)
Pelvic injury finding in CT?			
No	217 (97.8%)	250 (82.8%)	467 (89.1%)
Yes	5 (2.3%)	52 (17.2%)	57 (10.9%)

Table 2 – Baseline characteristics of those undergoing a pelvic x-ray

	Count and Percentage or Mean/SD, Median/IQR
Number of eligible patients with pelvic x-ray	307
Age (years)	Mean = 43.9 (SD = 19.1) Median = 40.6 (IQR = 27.3, 56.3)
Sex	
Female	75 (24.4%)
Male	232 (75.6%)
Type of trauma activation	
Trauma Alert	180 (58.6%)
Trauma Call	127 (41.4%)
Model of arrival at hospital	
Private transport	3 (1.0%)
Road ambulance	249 (81.1%)

	Count and Percentage or Mean/SD, Median/IQR
HEMS	48 (15.6%)
Unknown	6 (2.0%)
Other	1 (0.3%)
Type of trauma	
Motor vehicle accident	115 (37.5%)
Motor bike accident	50 (16.3%)
Low fall	20 (6.5%)
High fall (>1 metre)	39 (12.7%)
Cyclist	13 (4.2%)
e-Scooter	11 (3.6%)
Pedestrian	14 (4.6%)
Cutting/piercing	13 (4.2%)
Horse related	10 (3.3%)
Struck by collision with person/object	19 (6.2%)
Other	3 (1.0%)

Table 3 – Pelvic x-rays that had diagnostic value

	Number or Proportion (95% CI)
Number and % who had a pelvic x-ray	307/562: 54.6% (95% CI 50.4% to 58.8%)
Number and % whose management was changed by pelvic x-ray	52/307: 16.9% (95% CI 12.9% to 21.6%)
Number and % whose pelvic x-ray provided independent diagnostic value (including pelvic binder being removed)	93/307: 30.3% (95% CI 25.2% to 35.8%)
Number and % whose pelvic x-ray provided independent diagnostic value (excluding pelvic binder being removed)	70/306, 22.9% (95% CI 18.3% to 28.0%)
How was management changed?	N = 52
Pelvic binder removed	27 (51.9%)
Pelvic binder applied or adjusted	3 (5.8%)
Patient transferred to operating theatre/hybrid suite	5 (9.6%)
Patients hip relocated	2 (3.8%)
Orthopaedic referral	18 (34.6%)
Unknown	1 (1.9%)

Appendix 2: Interview Guide

BROAD TOPIC	EXAMPLE QUESTION
General conversation starter	Can you tell me a bit about your experience and role when caring for patients injured by trauma at the trauma calls/alerts in the RMH ED?
Role of the pelvic x-ray	When would you currently order a pelvic x-ray at a trauma call/alert? Are there any circumstances in which you would not order a pelvic x-ray?

	Do you feel it is necessary to undertake a pelvic x-ray if the patient is going to have a trauma CT?
Acceptability of de-implementation	How comfortable do you feel about reducing the number of pelvic x-rays that your order? [Affective attitude] What extra effort do you think will be required to reduce the number of pelvic x-rays that you order? [Burden] Do you think there are potential consequences of reducing the number of pelvic x-rays being ordered that we need to consider? [Ethicality] Do you think it would be possible to reduce the number of pelvic x-rays currently being ordered? Why/why not? [Perceived effectiveness] Do you think there is value in reducing the number of pelvic x-rays being ordered? [Interventional coherence] How confident would you feel about reducing the number of pelvic x-rays that you currently order? [Self-efficacy] How would it change your practice if you ordered less pelvic x-rays [Opportunity costs]
Extra information	Is there anything else you would like to add/discuss?