University Hospitals Coventry and Warwickshire NHS Trust

Audit of Pelvic Binder Position

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Objectives

- Audit the position of pelvic binders in trauma patients attending UHCW Emergency Department
- Assess any differences between brands of device used

Background

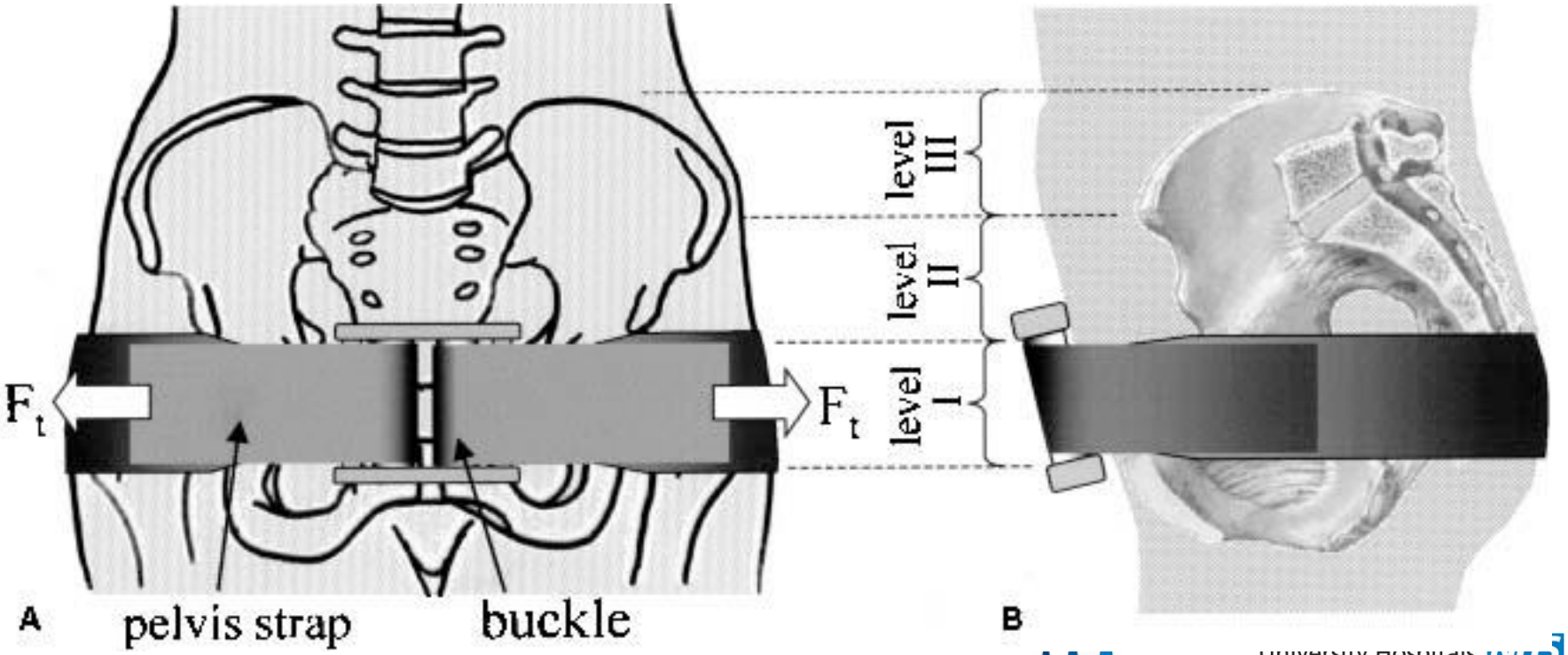
- Pelvic Circumferential Compression Devices (PCCDs) have been proven to be effective at reducing pelvic fractures and provide a suitable method for reducing life threatening haemorrhage associated with pelvic ring disruption Spanjersberg et al., Injury (2009)

Why is placement important?

- *"A sheet, pelvic binder, or other device can apply sufficient stability for the unstable pelvis at the level of the greater trochanters"* ATLS Manual 9th Ed.
- 3 studies examining level at which binder is applied and how this affects:
  - Reduction of diastasis (Bonner et al.)
  - Amount of compression required to achieve reduction of diastasis (Bottlang et al.)
  - Intra-peritoneal pressure (Bottlang et al.)

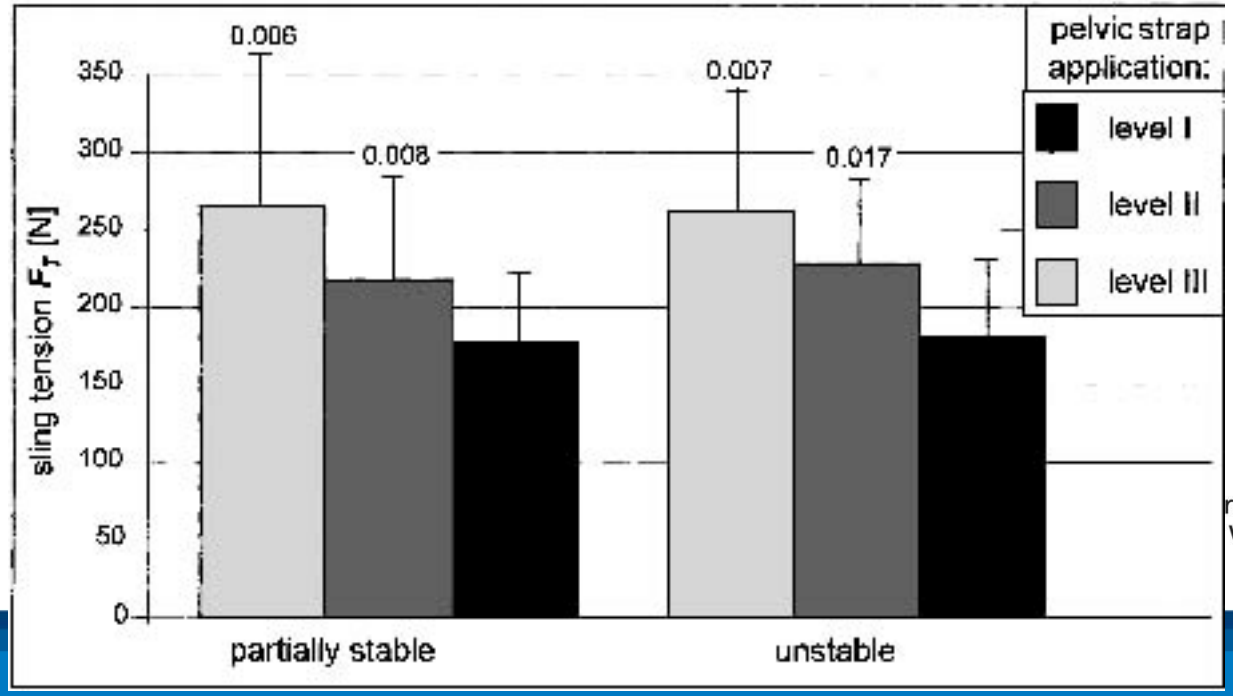
Bottlang et al. JBJS Am (2002)
Bottlang et al. J Orthop Tr (2002)

- Split binder placement into 3 levels:



Bottlang et al. JBJS Am (2002)
Bottlang et al. J Orthop Tr (2002)

- Pressure required to reduce APC II/III fractures when binder applied at the level of the GT's was significantly lower than either at the level of the mid pelvis or at the iliac crest

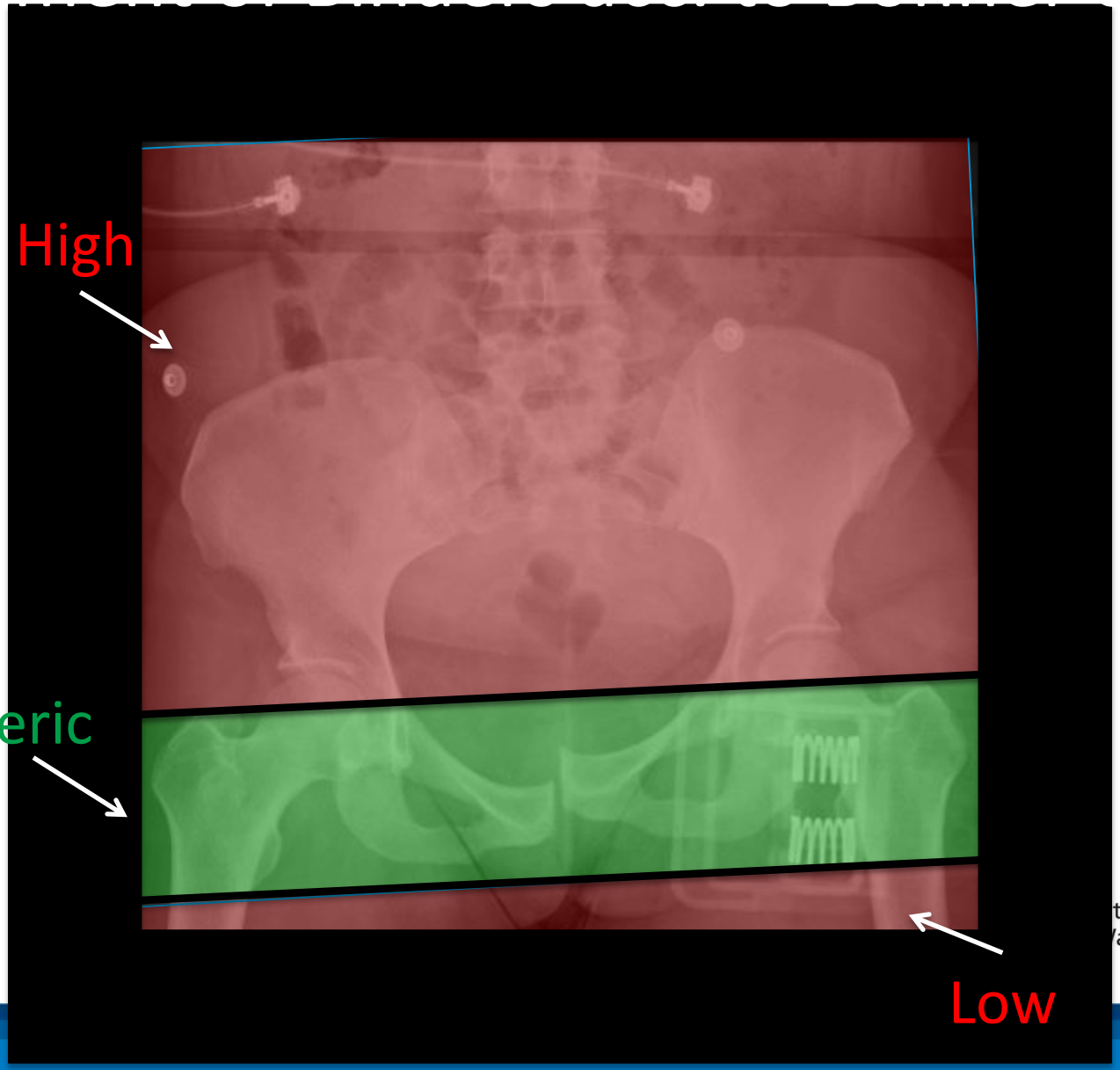


Bottlang et al., J Orthop Tr (2002)

- Reduction of the unstable pelvic fracture by strap application at level of GT's was characterized by an intraperitoneal pressure increase of 6.2 ± 5.8 mmHg & a strap– skin interface pressure of 24 mmHg
- At level of mid-pelvis: intraperitoneal pressure increase of 19.4 ± 13.8 mmHg
- At iliac crests: intraperitoneal pressure increase of 20.9 ± 13.2 mmHg

Bonner et al., JBJS (Br) (2011)

- Retrospectively examined radiographs of pts with pelvic binders in place at a military hospital
- Categorized according to placement: high- above GT's, trochanteric- between GT and LT, low- below LT


High
Trochanteric
Low

Bonner et al., JBJS (Br) (2011)

- The locations of pelvic binder in the 167 patients with adequate radiographs in this study *(27% of these patients had a pelvic fracture)*

Position	**Number of patients (%)**
– High	65 (*39*)
– Trochanteric	83 (*50*)
– Low	19 (*11*)

Bonner et al., JBJS (Br) (2011)

- The mean gap in the diastasis of the symphysis was 2.8 times greater (mean difference 22 mm) in the high group (n = 6) than in the trochanteric group (n = 11) ($p < 0.01$)

Conclusions from literature

- *Correct placement of PCCD at level of trochanters*
  - *Facilitates reduction (lower force required)*
  - *Improves reduction (reduces diastasis)*
  - *Causes a smaller increase in intraperitoneal pressure*

UHCW

- Approx. 100 Major Trauma Patients per month
- 3 different brands of binder in use by local ambulance crews:
  - Prometheus Pelvic Splint (Prometheus Medical Ltd)
  - SAM Pelvic Sling II™ (SAM Medical Products)
  - TPOD® (Pyng Medical Corporation)

PCCDS

Methods

- Retrospective audit
- Patients admitted to ED as trauma calls identified via TARN data
- Imaging reviewed on PACS to ascertain if PCCD in place or not
- Scout images for trauma pan CT's used to determine placement
- Centre of visible buckle/ buttons used to determine centre of PCCD

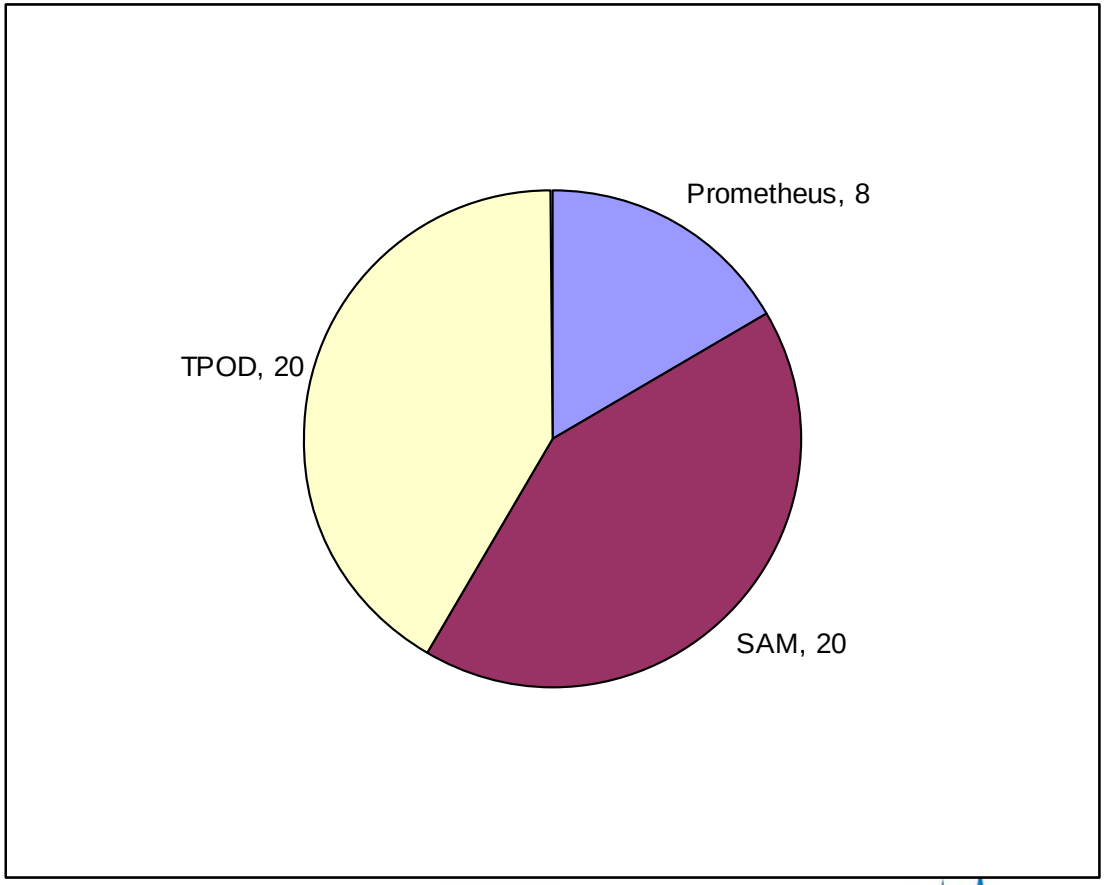
Methods 2

- 2 x Orthopaedics SpRs (authors) independently determined binder placement and ratified any disagreements together
- PCCDs categorised according to placement divisions set by Bonner et al.- high/ trochanteric/ low
- If centre of buckle/button passed between bilateral trochanters, deemed to be placed correctly

Results

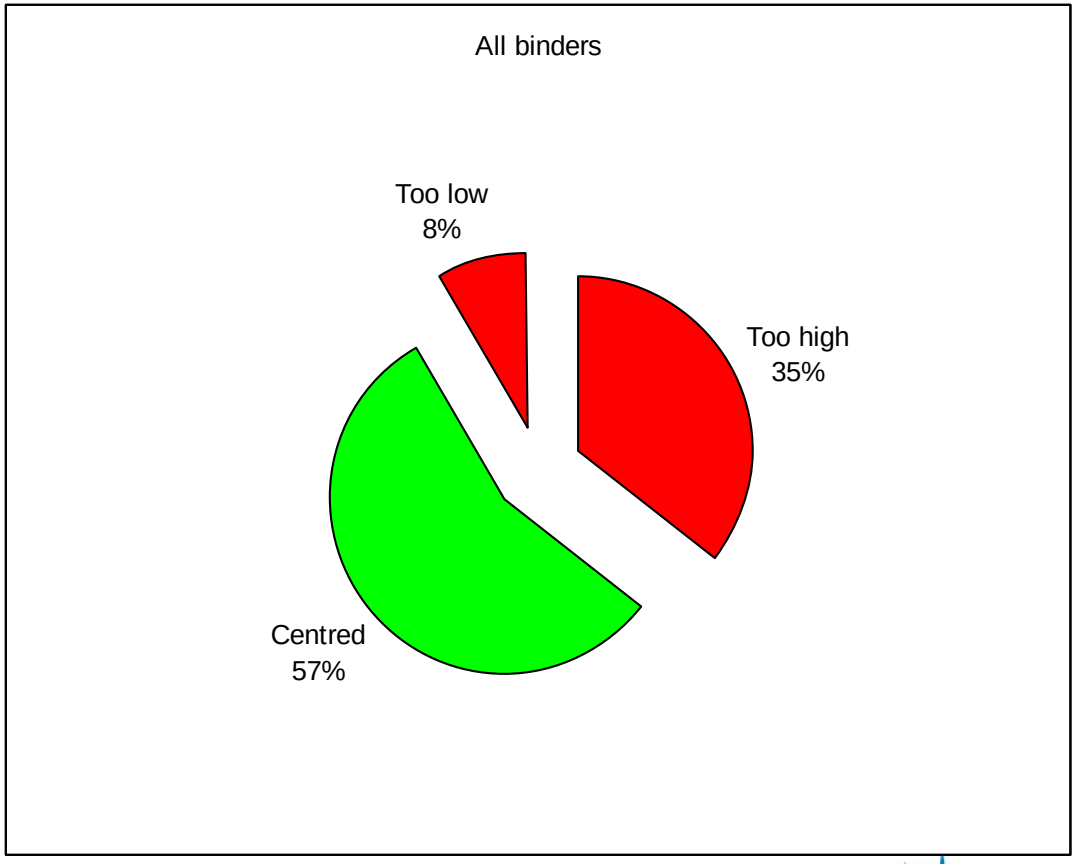
- 234 patients identified as being trauma calls from TARN data July/August 2014
- 48 of these identified as having a pelvic compression device on CT scan
- In binder cohort: 11 females and 37 males (F:M, 1:3.35)
- Mean age of binder cohort: 40.67 yrs (range: 11-83 yrs)

Results 1
Binder types



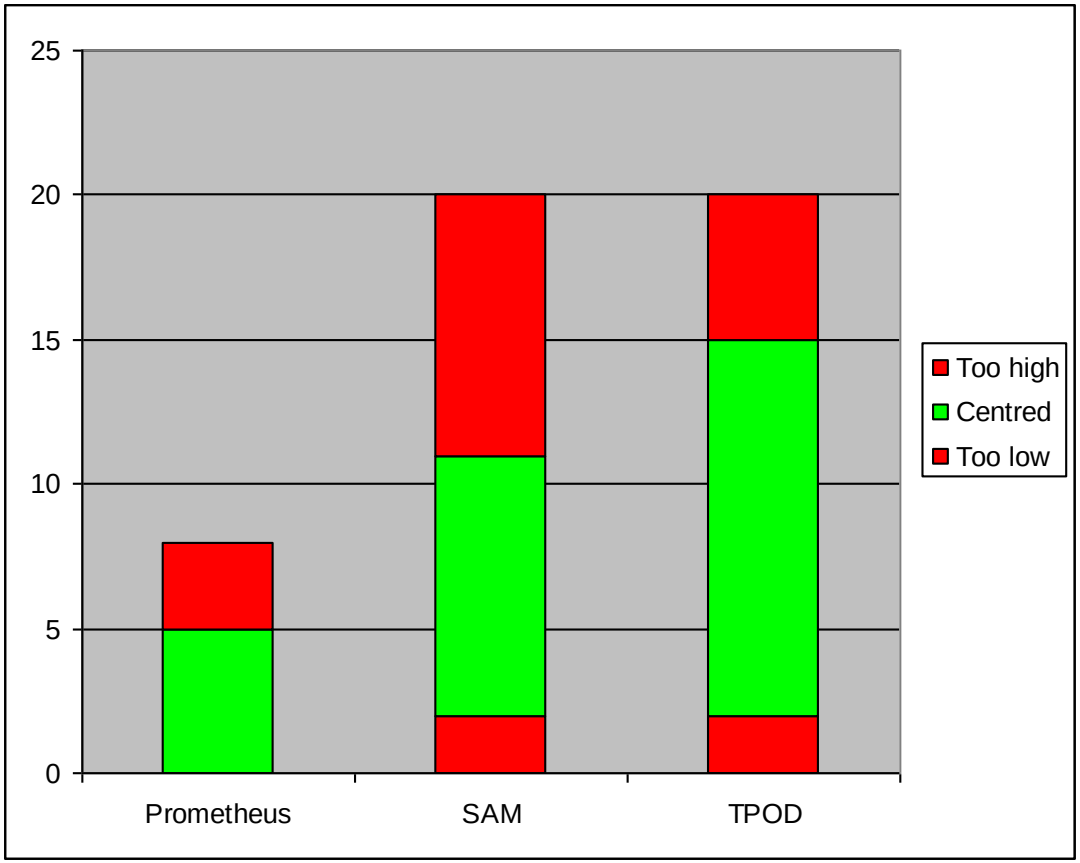
Prometheus	8
SAM	20
TPOD	20

Results 2
Binder position



	Too high	Centred	Too low
All binders	17	27	4

Results 3
Binder position by type



	Too low	Centred	Too high
Prometheus	0	5	3
SAM	2	9	9
TPOD	2	13	5

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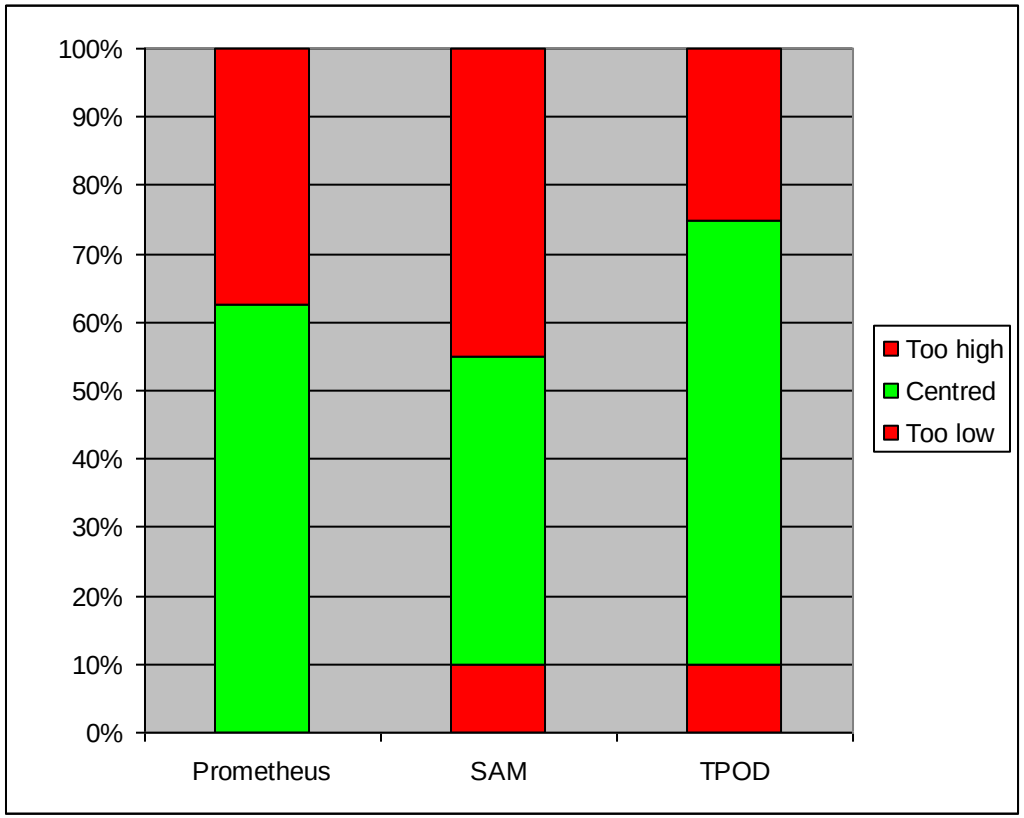
Results 4
Binder position by type



	Too low	Centred	Too high
Prometheus	0	62.50%	37.50%
SAM	10%	45%	45%
TPOD	10%	65%	25%

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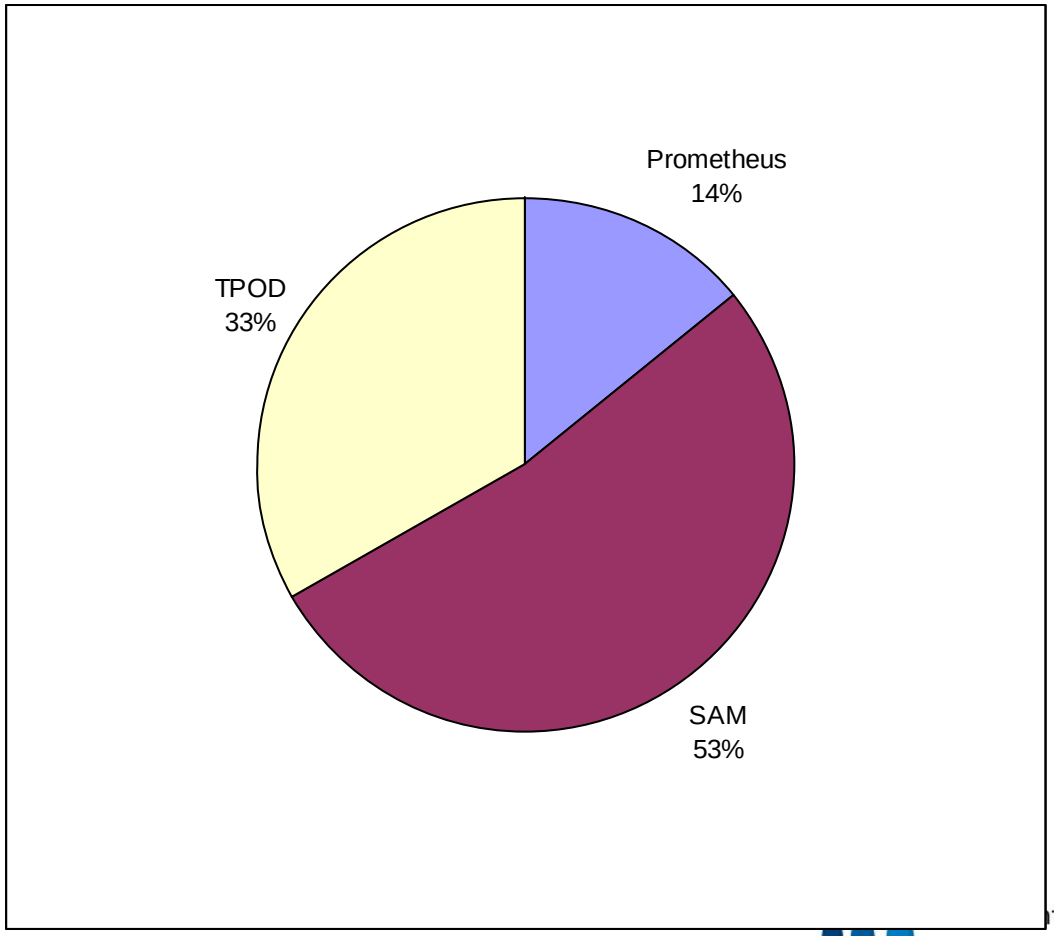
Results 5
Incorrectly placed binders by type



Results 6

- Comparison to Bonner et al's findings:

	High	Centred	Low
UHCW	35%	57%	8%
Bonner et al.	39%	50%	11%

Conclusions

- Over 40% of patients had their PCCD placed incorrectly
- Most of those placed incorrectly were too high- ~1/3
- Our findings were similar to the rates of binder placement reported by Bonner - and therefore probably representative and believable

Recommendations

- Education regarding placement of PCCDs
  - Presented to UHCW trauma steering group
  - Presented to CETN governance meeting
  - To be sent out to Ambulance services and other pre-hospital emergency services
  - ?Introduction of pelvic binder fitting into mandatory training
  - ?Production of a video that can be used to show pelvic binder fitting to aid training
- Re-audit after intervention

Limitations/ future research opportunities

- There is not currently published evidence regarding individual PCCDs and effect of placement (? Larger working length of wider devices such as TPOD)
- Binders may be repositioned prior to CT scan
- Binder position may have slipped after application during transfer
- As UHCW is MTC, many regional Ambulance services bring patients- poses difficulty for introducing education for these groups

References

- ATLS® (Advanced Trauma & Life Support) Student Course Manual, 9th Edition (2012), *American College of Surgeons*
- Bonner T, Eardley W, Masouros S, Matthew J, Gibb I, Clasper J, Accurate placement of a pelvic binder improves reduction of unstable fractures of the pelvic ring, *JBJS (Br),* **93-B** (11): 1524-1528
- Bottlang M, Simpson T, Sigg J, Krieg J, Madey S, Long W, (2002), Non-invasive reduction of open-book pelvic fractures by circumferential compression, *J Orthop Tr*, **16** (6): 367-373
- Bottlang M, Simpson T, Mohr M, Krieg J, Madey S, Long W, (2002), Emergent management of pelvic ring fractures with use of circumferential compression, *JBJS (Am)*, **84**: 43-47
- Spanjersberg W, Knops S, Schep N, van Lieshout E, Patka P, Schiper I, (2009), Effectiveness and complications of pelvic circumferential compression devices in patients with unstable pelvic fractures: a systematic review of literature, *Injury,* **40**(10):1031-5