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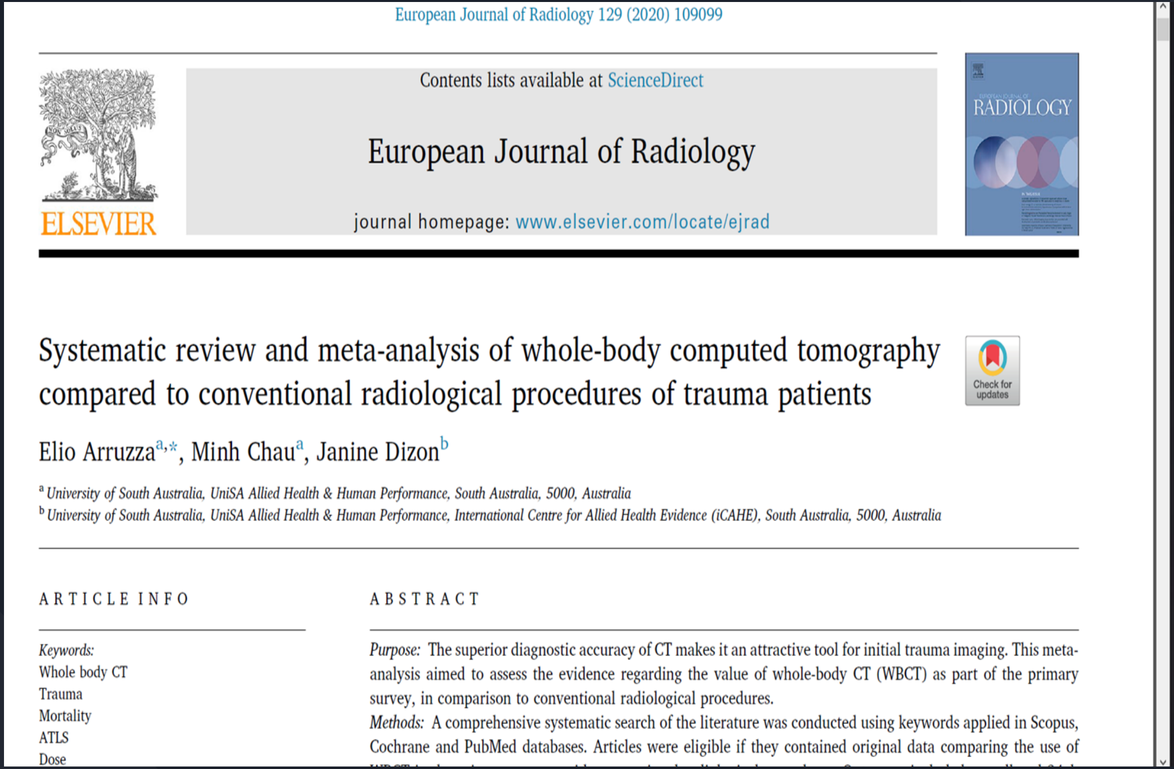
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Systematic review and meta-analysis of whole-body computed tomography compared to conventional radiological procedures of trauma patients

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ABSTRACT

Purpose: The superior diagnostic accuracy of CT makes it an attractive tool for initial trauma imaging. This meta-analysis aimed to assess the evidence regarding the value of whole-body CT (WBCT) as part of the primary survey, in comparison to conventional radiological procedures.
Methods: A comprehensive systematic search of the literature was conducted using keywords applied in Scopus, Cochrane and PubMed databases. Articles were eligible if they contained original data comparing the use of

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ABSTRACT

Purpose: The superior diagnostic accuracy of CT makes it an attractive tool for initial trauma imaging. This meta-analysis aimed to assess the evidence regarding the value of whole-body CT (WBCT) as part of the primary survey, in comparison to conventional radiological procedures.
Methods: A comprehensive systematic search of the literature was conducted using keywords applied in Scopus, Cochrane and PubMed databases. Articles were eligible if they contained original data comparing the use of WBCT in the primary survey, with conventional radiological procedures. Outcomes included overall and 24 -h mortality, emergency department (ED) time, intensive care unit (ICU) and hospital length of stay (LOS), and multiple organ dysfunction syndrome/failure (MODS/MOF) incidence. Radiation dose, mechanical ventilation duration and cost were evaluated qualitatively. Analysis was performed with Covidence, MedCalc Version 19.1.3. and Meta-Essentials.
Results: Fourteen studies were included. Statistical pooling demonstrated comparable rates between conventional procedures and WBCT (OR = 0.854, CI = 0.715–1.021, $p = 0.083$) in 63,529 patients across 11 studies. A significant finding favouring WBCT was discovered for ED time (SMD = -0.709, CI -1.198 to -0.220, $p = 0.004$). Patients experienced similar 24 -h mortality rates ($p = 0.450$), MODS/MOF incidence ($p = 0.274$), and hospital ($p = 0.541$) and ICU LOS ($p = 0.457$). WBCT is associated with increased radiation dose and mechanical ventilation duration.
Conclusion: This review demonstrates that WBCT markedly reduces time spent in ED. No significant differences in mortality rate are suggested. WBCT currently entails greater radiation dose and mechanical ventilation time. Further research is necessitated to address limitations of predominately retrospective observational data available.

Introduction

- More than 5 million people die from trauma injuries annually, accounting for 9% of global mortality and the leading cause of death among people aged 1–45
- Current practice relating trauma in emergency department is : Advanced Trauma Life Support (ATLS) protocol .
- Encompass a combination of fast and priority-based physical examination, plain x-ray of the chest and pelvis, focused assessment with sonography for trauma (FAST), and supplementary selective region-specific computed tomography (CT)
- Problem statement: Time-consumption and misdiagnosis
- Using traditional diagnostic protocols, the incidence of missed injuries or delayed diagnoses of musculoskeletal trauma has ranged from 1.3 to 39%
- In recent years, improvement in CT technology has seen highly accurate and rapid imaging of many injury presentations.
- The enhanced capability of Multi-slice computed tomography (MSCT) has prompted some practices in developed countries to integrate whole-body CT into trauma management .

- Whole-body computed tomography (WBCT) : CT scan of the head, cervical spine, chest, abdomen and pelvis.
- On average, WBCT exposes patients upwards of 20mSv (milliSieverts) of effective radiation dose; for a 20-year-old female, a WBCT will create an estimated additional lifetime risk of cancer of 1 in 184 or a 99.45 % chance of having no effect . This is comparable to the risk associated with radiation dose of 24 mSv in the average 35-year-old male.
- The need for justification of the dose whether the intervention improves health outcomes.
- Cost of imaging
- The ever-evolving nature of radiology practice and technology therefore calls for an update of the literature, such that the most current research in the application of WBCT may inform clinical practice.

Methods

- The Preferred Reporting Items for Systematic Reviews and Meta- Analyses (PRISMA) statement was utilised to perform this meta-analysis

Sample : The databases Cochrane Library, PubMed, and Scopus were systematically searched for literature published between 1947 until December 2019.

Search terms encompassed the following keywords:

[["WBCT" or "FBCT" or "TBCT" or "whole body computed tomography" or "full body computed tomography" or "total body computed tomography" or "whole body CT" or "full body CT" or "total body CT" or "panscan" or "pan computed tomography" or "pan CT" or "whole body computed tomography" or "MSCT" or "MDCT" or "multi-slice spiral computed tomography" or "multi-detector computer tomography" or "multi-slice spiral CT" or "multi-detector CT"] AND [Trauma* or Wound* or Injur* or Shock* or Emergen* or "Multiple trauma*" or "Multiple injur*" or "Severe injur*" or "Severe trauma*" or Polytrauma or "Major trauma*"]]. Furthermore, the reference lists of eligible studies and previous systematic reviews were investigated for additional references. Search terms were limited to English publications and human participants

Inclusion & exclusion criteria :

Inclusion :

- Randomised or observational study design which compared WBCT during the primary survey of trauma patients with conventional radiological procedures.
- Both prospective and retrospective studies
- WBCT as forming part of the intervention protocol, but it did not specifically have to be the first modality utilised (ie. immediate).
- ‘conventional radiological procedures’ encompasses practices as defined by ATLS protocol (conventional x-ray and FAST ultrasound followed by selective CT if required), or selective CT solely (without preceding x-ray or FAST).
- Studies involving patients experienced either blunt or penetrating mechanism of injury, and inclusion criteria was not dependent upon a specified injury severity score (ISS) or age.

Exclusion:

- Editorial comments
- Reviews, opinion articles and non- English journals
- Previous meta-analyses

Outcomes :

Primary outcome : overall mortality rate

- Mortality is defined as the frequency of occurrence of death during a specified interval.
- The specified interval : initial imaging took place to when the mortality status of the included patient.
- Two studies which reported on 28 or 30-day mortality rather than true ‘overall mortality’, were included in this analysis.
- sufficient period of time to assess mortality, given the established ‘trimodal’ distribution of trauma-related deaths featured in literature.
- The concept is trauma-related deaths occur within a ‘golden hour’ (50–60 %), followed by a lesser magnitude within 24 h (30 %).

Secondary outcomes : 24 -h mortality rate, time spent in the emergency department, hospital length of stay (LOS), intensive care unit length of stay (ICU LOS), incidence of multiple organ dysfunction syndrome (MODS)/multiple organ failure (MOF), radiation dose, duration of mechanical ventilation and cost.

- Quantitative analysis on the latter three outcomes was not included in the meta-analysis because of an insufficient number of studies reporting on applicable figures. Thus, Qualitative analysis was therefore conducted.

Data extraction & study quality assessment

Data was extracted independently by two reviewers (ESA and JMD).

- Characteristics of studies (publication year and study period, sample size, country, design), characteristics of patients (age, Injury Severity Score (ISS), male %), and characteristics pertaining to the intervention and outcomes.

Assessment of study quality was conducted using the Newcastle-Ottawa Scale (NOS) for non-randomised studies and the Scottish Intercollegiate Guidelines Network (SIGN) Methodology Checklist for randomised controlled trials.

- Recommended by the Cochrane Collaboration, the NOS is a risk of bias assessment tool validated for case-control and longitudinal studies.

The tool comprises of a 'star' system depends on
i) the selection of study groups,
ii) group comparability, and
iii) determination of either the exposure or outcome of interest.

- SIGN is a popular method to ensure that the extent of a study's internal and external validity is assessed.

Statistical analysis

- MedCalc for Windows, version 19.1.3 (MedCalc Software, Ostend, Belgium).
- Heterogeneity between studies was determined via implementation of the Chi-Square test and Inconsistency Index - was calculated using both the I2 statistic with a threshold of >50 %, and the Chi2 test with p<0.05 indicating significant heterogeneity.
- Random effects model was applied where these thresholds were exceeded, whilst the fixed effects model was applied for all other outcome measures.
- Publication bias was assessed using Meta-Essentials: Workbook for meta-analysis.

  - figures obtained from Egger's test.
  - whereby P-value <0.05 for this test indicated significant publication bias.

Protocol:

- Some of the studies includes injury mechanisms of a penetrative source relative to blunt trauma presentations.
- Baseline characteristics : age and gender
- Significant discrepancy in baseline ISS values was seen in five of the seven studies which reported p-values, more often indicating greater ISS values for the WBCT cohort [28,39–41]. One study did not report ISS, but employed a propensity score to identify and normalise possible confounders such as blood pressure, heart rate and Glasgow Coma Score (GCS).
- WBCT: Unenhanced scanning of the head prior to contrast enhanced imaging of the chest, abdomen and pelvis.
- non-WBCT cohort : conventional ATLS protocol, though three studies featured selective CT only.
- Five studies featured truly ‘immediate’ WBCT
- Seven studies featured an invervention protocol where done other modalities prior to WBCT.

Table 1

Characteristics of included studies and patients.

Author	Year	Period	Region	Centre	Design	Cases A	Cases B	Age A	Age B	Age p	Male % A	Male % B	Male % p	ISS A	ISS B	ISS p
Weninger et al.	2007	01–04	AUT	S	Re	185	185	43.5 (17.2)	40.7 (18.2)	p>0.05	72.4	73.4	>0.05	26.6 (10.3)	27.6 (11.5)	>0.05
Wurmb et al.	2011	01–06	DEU	M	Pro	163	155	38 (3–87)*	38 (2–82)*	NA	75	77	NA	27 (17–41)*	24 (13–34)*	0.001
Hutter et al.	2011	00–07	DEU	S	Pro	608	313	43.9 (19.3)	43.5 (20.7)	<0.001	73.68	74.76	NA	28.3 (11.8)	26.4 (12.2)	<0.001
Yeguiayan et al.	2012	04–07	FRA	S	Pro	1696	254	NA	NA	NA	76.1	73.2	NA	NA	NA	NA
Hsiao et al.	2013	10–11	AUS	S	Pro	98	562	45.2 (20.9)	44.0 (20.3)	0.595	82.7	68.3	0.004	17 (16)	5 (6)	<0.001
Huber-Wagner et al.	2013	93–09	DEU	M	Pro	9233	7486	45.2 (19.8)	44.6 (20.4)	<0.001	73	73.2	0.77	29.7 (12.2)	27.7 (11.9)	<0.001
Gordic et al.	2015	08	CHE	S	Re	120	120	46.66 (20.7)	44.2 (18.6)	0.339	67.5	74.2	0.256	22.0 (20)	22.0 (18)	0.838
Hong et al.	2016	09–13	TWN	S	Re	89	55	42.99 (19.62)	40.62 (21.0)	0.694	71.9	69.1	NA	37.53 (15.33)	32.33 (9.69)	NA
Chan et al.	2016	11–13	USA	S	Re	1544	9774	44.2 (18.7	49.0 (21.3)	0.237	73.6	66.6	0.154	NA	NA	NA
Tsutsumi et al.	2018	04-15	JPN	M	Re	19,766	20,669	56 (36–71)*	60 (40–75)*	NA	69.6	67.6	NA	22 (13–29)*	17 (10–25)*	NA
James et al.	2017	16	USA	S	Pro	206	220	49.1 (21.8)	48.4 (21.2)	NA	72.8	61.4	NA	4 (1–9)*		NA
Palm et al.	2018	02–13	DEU	M	Re	11,307	5621	46.6 [45.9–47.2]	43.0 [42.1–43.9]	NA	72.2	72.7	NA	23.9 [23.4–24.3]	23.7 [23.1–24.3]	NA
Sierink et al.	2013	09–11	NED	S	Pro	152	152	43.91 (19.67)	43.63 (18.61)	0.3324	70.4	71.7	0.687	18 (9–29)*	18 (8–29)*	0.042
Sierink et al.	2016	11–14	NED	M	RCT	541	542	42 (27–59)*	45 (26–59)*	NA	76	76	NA	20 (10–29)*	19 (9–29)*	NA

S Single, M Multiple, Re Retrospective, Pro Prospective, A WBCT, B Non-WBCT, ISS Injury Severity Score NA Not Available, RCT Randomised Controlled Trial.

* Median & IQR AUT Austria, DEU Germany, FRA France, AUS Australia, CHE Switzerland, TWN Taiwan, USA United States of America, JPN Japan, NED Netherlands Age and ISS reported in Mean & SD except where otherwise specified.

Results

A total of 2921 studies were identified through computerised literature search:
- 81 from Cochrane Library
-1890 from PubMed and
-950 from Scopus.

909 duplicates were removed with the aid of EndNote X10 Software.

Fourteen studies were included in this meta-analysis ; however, two of these were solely analysed qualitatively, due to a deficiency in eligible data for their reported outcome measure (dose) across the pooled cohort as mentioned earlier.

Quantitative analysis was performed for the remaining twelve studies.

A diagram adapted from the PRISMA statement, summarising the search and screening method, is presented in Fig. 1.

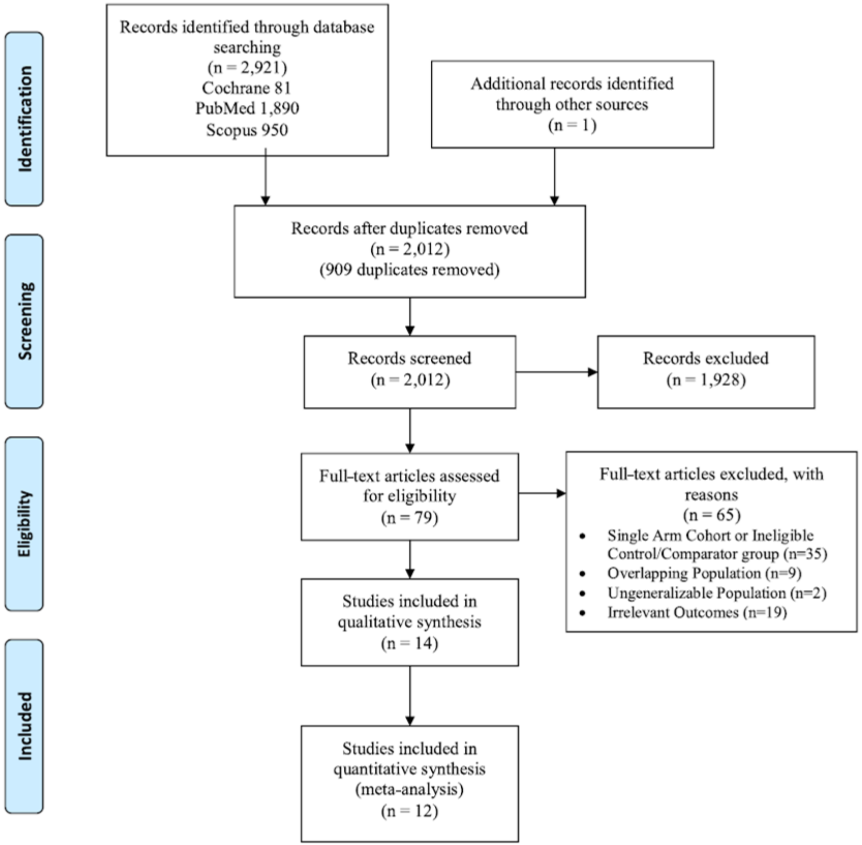
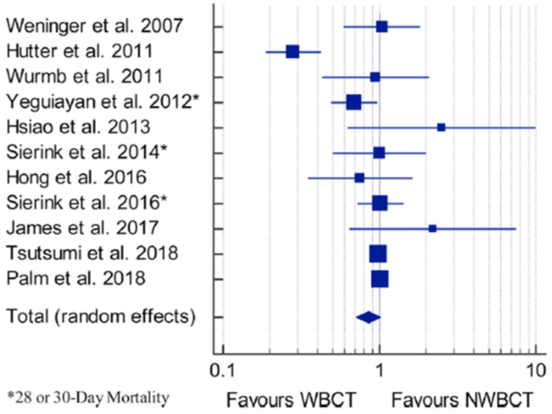


Fig. 1. Adapted PRISMA flow-chart [41].

Study	WBCT	NWBCT	Odds ratio	95% CI	z	P	Weight (%) Random
Weninger et al. 2007	31/185	30/185	1.040	0.600 to 1.801			7.01
Hutter et al. 2011	48/608	73/313	0.282	0.190 to 0.418			10.34
Wurmb et al. 2011	14/163	14/155	0.946	0.436 to 2.056			4.22
Yeguiayan et al. 2012*	277/1,696	56/254	0.690	0.499 to 0.954			12.40
Hsiao et al. 2013	3/98	7/562	2.504	0.636 to 9.852			1.57
Sierink et al. 2014*	20/152	20/152	1.000	0.514 to 1.945			5.35
Hong et al. 2016	21/89	16/55	0.753	0.352 to 1.610			4.35
Sierink et al. 2016*	86/541	85/542	1.016	0.733 to 1.409			12.30
James et al. 2017	8/206	4/220	2.182	0.647 to 7.358			1.95
Tsutsumi et al. 2018	3,243/19,766	3,438/20,669	0.984	0.933 to 1.037			20.58
Palm et al. 2018	1,798/11,307	883/5,621	1.015	0.929 to 1.108			19.94
Total (random effects)	5,549/34811	4,626/28,728	0.854	0.715 to 1.021	-1.736	0.083	100.00

Test for heterogeneity

Q	47.3974
DF	10
Significance level	P < 0.0001
I^2 (inconsistency)	78.90%
95% CI for I^2	62.80 to 88.03



*28 or 30-Day Mortality

Fig. 2. Overall Mortality*28 or 30-Day Mortality.

Fig. 2. Overall Mortality*28 or 30-Day Mortality.

Study	WBCT	NWBCT	Odds ratio	95% CI	z	P	Weight (%) Random
Wurmb et al. 2011	5/163	3/155	1.603	0.377 to 6.826			4.26
Yeguiayan et al. 2012	102/1,696	21/254	0.710	0.435 to 1.158			21.37
Huber-Wagner et al. 2013	818/9,233	896/7,486	0.715	0.647 to 0.790			42.33
Sierink et al. 2014	11/152	10/152	1.108	0.456 to 2.691			9.79
Sierink et al. 2016	43/541	33/542	1.332	0.832 to 2.131			22.25
Total (random effects)	979/11,785	963/8,589	0.886	0.647 to 1.213	-0.756	0.450	100.00

Test for heterogeneity

Q	8.3732
DF	4
Significance level	P = 0.0788
I^2 (inconsistency)	52.23%
95% CI for I^2	0.00 to 82.44

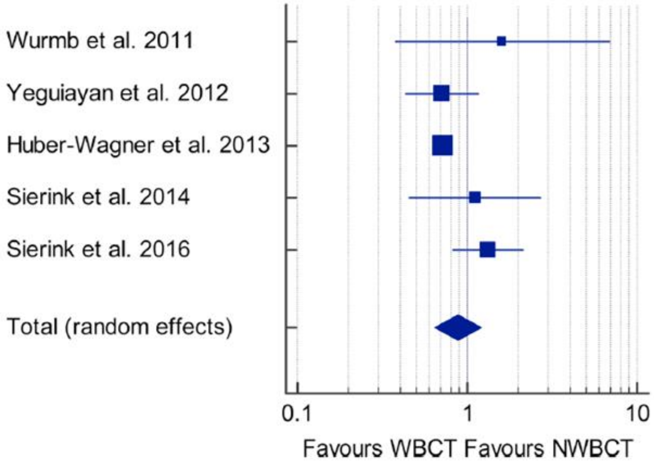


Fig. 3. 24-Hour Mortality.

Study	WBCT			NWBCT			Total	SMD	SE	95% CI	t	P	Weight (%)
	$\bar{x}$	σ	N	$\bar{x}$	σ	N							Random
Weninger et al. 2007	70	17	185	104	21	185	370	-1.776	0.123	-2.017 to -1.535			19.79
Hutter et al. 2011	83.5	49.2	608	144.7	115.8	313	921	-0.780	0.0718	-0.921 to -0.639			20.43
Hong et al. 2016	108.62	80.13	89	186.32	168.32	55	144	-0.636	0.175	-0.982 to -0.291			18.86
James et al. 2017	390.9	256.2	206	459.1	422.8	220	426	-0.193	0.0970	-0.384 to -0.00261			20.15
Palm et al. 2018	67.6	59.68	11,307	84.3	126.23	5,621	16,928	-0.191	0.0164	-0.223 to -0.159			20.77
Total (random)			12,395			6,394	18,789	-0.709	0.249	-1.198 to -0.220	-2.843	0.004	100.00

Test for heterogeneity

Q	227.6599
DF	4
Significance level	P < 0.0001
I^2 (inconsistency)	98.24%
95% CI for I^2	97.32 to 98.85

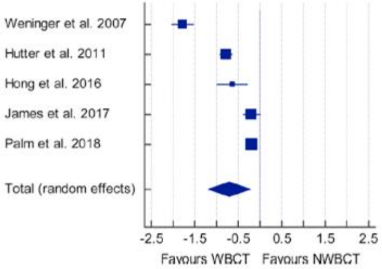


Fig. 4. Time Spent in the Emergency Department.

Study	WBCT			NWBCT			Total	SMD	SE	95% CI	t	P	Weight (%)
	$\bar{x}$	σ	N	$\bar{x}$	σ	N							Random
Weninger et al. 2007	13.6	14.3	185	16.8	18.7	185	370	-0.192	0.104	-0.396 to 0.0127			22.63
Hutter et al. 2011	16.2	17.3	608	16.2	17	313	921	0.000	0.0695	-0.136 to 0.136			25.62
James et al. 2017	9.7	12.7	206	7.4	10.9	220	426	0.194	0.0970	0.00381 to 0.385			23.26
Palm et al. 2018	8.9	18.99	11,307	3.3	22.95	5,621	16,928	0.275	0.0164	0.243 to 0.307			28.49
Total (random)			12,306			6339	18,645	0.0801	0.108	-0.131 to 0.291	0.744	0.457	100.00

Test for heterogeneity

Q	33.5592
DF	3
Significance level	P < 0.0001
I^2 (inconsistency)	91.06%
95% CI for I^2	80.21 to 95.96

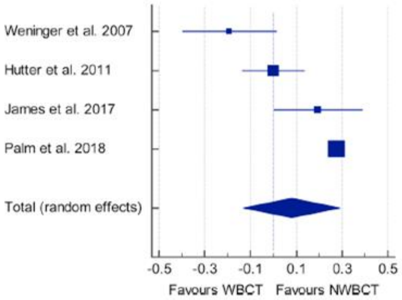


Fig. 5. Intensive Care Unit Length of Stay.

Study	WBCT	NWBCT	Odds ratio	95% CI	z	P	Weight (%)
							Random
Weninger et al. 2007	21/185	35/185	0.549	0.306 to 0.985			32.81
Hutter et al. 2011	119/608	8/313	9.278	4.471 to 19.253			31.28
Huber-Wagner et al. 2013	3,359/9,233	2,125/7,486	1.443	1.351 to 1.541			35.92
Total (random effects)	3,499/10,026	2,168/7,984	1.880	0.607 to 5.828	1.094	0.274	100.00

Test for heterogeneity

Q	35.6571
DF	2
Significance level	P < 0.0001
I^2 (inconsistency)	94.39%
95% CI for I^2	86.99 to 97.58

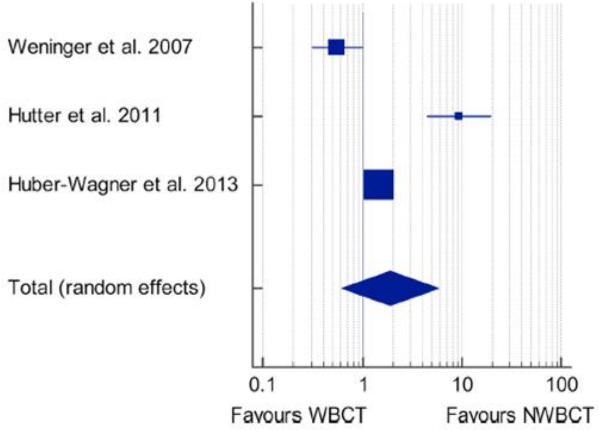


Fig. 7. Incidence of Multiple organ dysfunction syndrome (MODS)/Multiple Organ Syndrome (MOF).

Characteristics	Sample size	Heterogeneity	Random effects analysis	Egger's test P-value <0.05
Overal mortality	63,539 adult patients across 11 included studies. The WBCT portion of this sample (34,811) - more deaths and non-WBCT (28,728)	Presence (I2=83.72,p<0.001)	No significant difference	No bias (p=0.482).
24 hour mortality	(20,374), 11,785 patients who underwent WBCT and NWBCT 8589	Some heterogeneity (I2=52.23 %, p=0.0788)	Implemented, A nonsignificant finding was discovered (Pooled OR=0.886, CI0.647–1.213, p=0.450).	No significant publication bias (p=0.142)
ED time :	Five studies produced a sample size of 12,395 in the WBCT cohort and 6394 in the non-WBCT cohort	Significant heterogeneity (I2=98.24 %, p<0.0001).	Significantly shortened ED time was demonstrated for WBCT.	No significant finding (p=0.152)
ICU LOS	12,306 patients in the WBCT cohort , 6339 in non-WBCT = four included studies reporting on length of stay in the ICU	Heterogeneity was present amongst studies (I2=91.06, p<0.0001).	No significant difference between the two groups (Pool SMD=0.0801, CI -0.131 to 0.291, p=0.457).	Non-significant (p=0.130).

Hospital LOS	Five studies compared the hospital length of stay experienced by patients. Sample size of 18,528 in the WBCT group (11,885 vs 6643).	significant heterogeneity was detected (I2=92.07 %, P<0.001).	significant effect with application of this model (Pooled SMD=0.0815, CI -0.180 to 0.343, p=0.541).	No significant finding for publication bias (p=0.337).
Incidence of MODS/MOF	the study by Huber-Wagner and colleagues contributed to approximately 98 % of the 18,010 sized sample .	significant heterogeneity (I2=94.39 %, p<0.0001).	Quantitative analysis of three studies : no significant difference in the incidence of multiple-organ disease/syndrome using the random effect model (Pooled OR=1.880, CI 0.607–5.828, p=0.274)	No significant finding for publication bias was found (p=0.858).
Duration of mechanical ventilation	five studies- Four of these demonstrated a greater ventilation time for the WBCT . The mean number of days under mechanical ventilation across groups ranged from 0 to 14.3 days though only two studies demonstrated durations above five days	highest mean ISS amongst the included pool		Huber-Wagner demonstrated the opposite effect from a substantially larger sample size
Cost	Both Hong et al. 2016 and Sierink et al. 2016 discovered, that the cost associated with the WBCT group was not significantly greater and in fact, tended to be lower relative to non-WBCT.		James and colleagues found that the mean cost of a blunt trauma patient's hospital stay increased by $4971 after the WBCT protocol was introduced	

Summary

- In the case of overall mortality, both of Huber-Wagner's studies and Lang et al. 2017 were excluded in favour of Palm et al. 2018 , as the latter utilised an identical database that provided a greater sample size, retrospective.
- Total of 11 studies were included in analysis of overall mortality.
- With reference to the NOS, all evaluated studies achieved maximum points in the selection category , demonstrating a sound representation of the cohort relative to the real-world population. Seven articles were not given maximum stars for comparability due to their inability to control for potential confounders.
- All studies received maximum possible stars in the outcome category.
- After application of the SIGN checklist, Sierink et al. 2016 was deemed to be of high quality.

Discussion

First meta-analysis of current published literature including a higher-level source of evidence (RCT) and of good quality.

In this meta-analysis,

- No significant difference : overall mortality, and most of the secondary outcomes (24 -h mortality, ICU LOS, Hospital LOS, Incidence of MODS/MOF) in patients who experienced whole-body CT in comparison to the standard radiological protocol.
- WBCT was observed to significantly reduce ED times.

This study finding is consistent with that obtained in the recent RCT , though recent meta-analyses concluded that the application of WBCT significantly reduces mortality rate .

- Wada et al. 2013 [45], which demonstrated significant favourability towards WBCT use; however was excluded from our quantitative analysis, as the research design compared conventional procedures against a combination of WBCT with the same conventional protocols . This may therefore indicate that the high accuracy and prompt scanning time offered by WBCT, may rather serve as a suitable addition to conventional protocols, given patient dose can be justified.
- Penasco et al. 2018 was also not included in quantitative synthesis, on the grounds that its relatively high mean age was not generalisable to the target population.

Table 3
Dose experienced by patients in WBCT vs non-WBCT samples.

Study	Cases (n)		Outcome	Dose (mSv)		P
	WBCT	Non-WBCT		WBCT	Non-WBCT	
Asha et al. 2012	624	656	n > 20 mSv (%) (CI)	122(19.6) (16.6 – 22.7)	76 (11.6) (9.1 – 14.1)	< 0.001
Gordic et al. 2015	120	120	Mean	29.5	15.9	< 0.001
Sierink et al. 2016	541	542	Median (IQR)	21 (20.9–25.2)	20.6 (11.8 – 27.6)	< 0.001
James et al. 2017	206	220	Mean (SD)	28.1 (14.3)	19.9 (18.9)	< 0.001

SD Standard Deviation CI Confidence Interval n > 20 mSv (%) the proportion of trauma patients receiving a radiation dose > 20 mSv.

- WBCT was observed to reduce ED times in all included studies- for faster diagnosis for definitive treatment and lessening the impact of ED overcrowding
- Patients in the WBCT group exhibited higher ISS values - indicate that patients considered less severely injured were placed in the non-WBCT cohort, and thus expectantly experienced better prognosis. Furthermore, imaging of greater diagnostic quality more accurately identifies injuries that contribute to the magnitude of ISS; hence, rather than ideally being independent of injury severity, a greater degree and accuracy of imaging undesirably yields greater injury scores
- Some studies shows reduction of mortality in WBCT patients likely had an inverse effect on the incidence of MODS/MOF and prolonged days under mechanical ventilation.
- Though four studies reported on dose via differing outcome measures, dose levels were significantly lower in the non-WBCT cohort. The issue of clinical dose justification remains somewhat controversial.
- Sierink et al. demonstrated that although dose was higher during the primary survey in the WBCT cohort, however able to justified- due to decreased diagnostic accuracy of conventional methods

Limitation

- In large proportion of patients (46 %) in the non-WBCT group experienced sequential CT scans which ultimately eventuated in a non-immediate WBCT . This may introduce bias in the result interpretations, as noted lesser in mortality due to the increased amount of non-immediate WBCT scans in the conventional radiological procedure group.
- WBCT is likely more readily available in more developed countries and/or specialised trauma institutions and therefore, mortality differences may be more truly representative of the institution's coexisting resources, staff experience and protocol-driven nature.
- Discrepancies in protocol and imaging pathway, specific parameters including slice thickness, rotation time, table speed contrast and distance from the scanner to the ED were not regularly stated.
- Primary assessment by emergency physicians - patient selection, and the decision to obtain necessary imaging by the treating team was not standardised across studies.

Conclusion

- The value of WBCT and non-WBCT : no significant value added in outcomes based on: overall mortality, 24 -h mortality, ICU length of stay, Hospital length of stay and incidence of MODS/MOF for trauma patients.
- While , WBCT is associated with increased radiation dose and longer duration of mechanical ventilation.
- However, WBCT offers an advantage in shortening ED times.

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Hospital Stay Cost US$ 10,472 (9448) 12,305 (9406) 0.688Sierink et al. 2016 Hospital Stay Cost € 24,967 (21,880–28,752)*26,995(23,326–30,908)*0.44James et al. 2017

Hospital Stay Cost US$ 18,544 (36,800) 13,573 (25,507) 0.010Radiology Cost US$ 1362 (1297) 1312 (1017) 0.629Data reported in Mean (SD) unless otherwise specified.* Median (CI).E. Arruzza, et al. European Journal of Radiology 129 (2020) 10909911

Thank you.