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To Plate or Not to Plate: A Propensity Matched Analysis of Outcomes in Patients Undergoing Rib Fixation; An MTQIP Study

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Disclosure Information

- Speaker: Synthes

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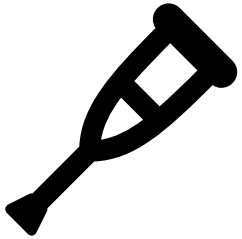
Background

Rib fractures: Nearly 15% of all trauma admissions

Mortality rate: All patients 13%.

Short term: Pain, respiratory failure, pneumonia & death

Elderly: Each rib increases risk of pneumonia by 27% and death by 19%



Long term: Decreased functional capacity & chronic pain.

Return to work: 59% at 6 months

References: 1,2, 5, 6

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Background

Traditional management: Muti-modal pain control, pulmonary hygiene, early mobilization & ventilatory support

Surgical stabilization: Investigated to mitigate sequelae of rib fractures

Increased adoption: 76% increased utilization from 2007 to 2014

References: 4-6, 10-12, 13

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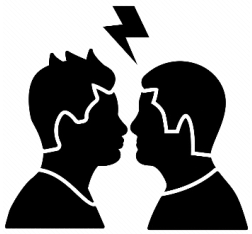
Background

Evolving indications: Flail chest conditionally recommended
Research: Non-flail, geriatrics



Controversy ongoing

Variable benefit: Mortality, mechanical ventilation, LOS, QOL

Fill the gap: Propensity matched analysis – ORIF vs No-ORIF
Geriatric and flail sub-analysis

References:2, 11, 15

MTQIP Presentation

Methods

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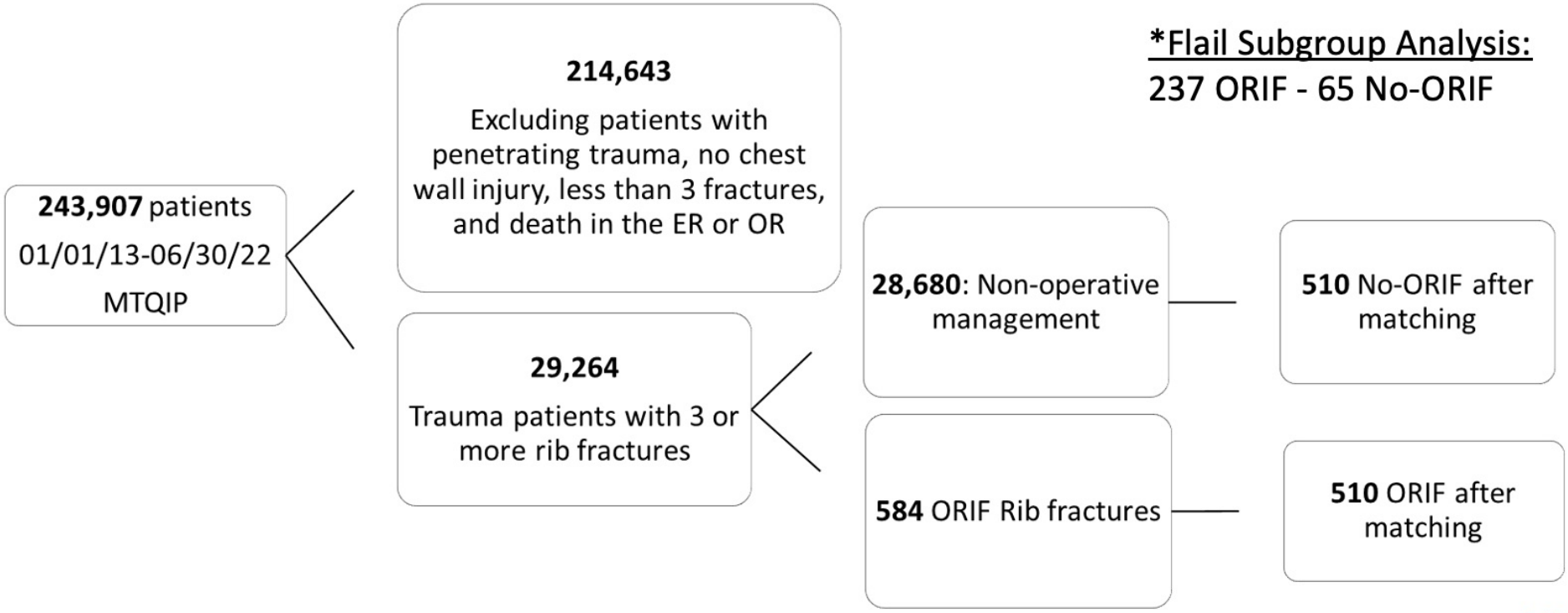
*Geriatric Subgroup Analysis:
163 ORIF - 150 No-ORIF

*Flail Subgroup Analysis:
237 ORIF - 65 No-ORIF



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Statistics

Propensity match analysis across 25 demographic, injury, & comorbid conditions

Age	AIS Head & Neck	Functionally Dependent
Race	AIS Chest	COPD
Ethnicity	AIS Abdomen	CHF
Sex	AIS Extremity	MI w/in 6 months
Insurance Status	Blood Pressure	Hypertension
ISS	Pulse	CRF
Intubation Status	Smoker	DM
>4 U pRBC	Cirrhosis	GCS

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Primary & Secondary Outcomes

Primary outcome

Death and/or hospice

Secondary outcomes

Hospital Disposition	Deep SSI	DVT
*ARDS	Pulmonary embolism	Systemic Sepsis
*Pneumonia	Acute Renal Failure	Return to OR
*VAP	Stroke/CVA	Return ICU
*Ventilator Days	Cardiac Arrest	ICU & HLOS
*Unplanned Intubation	MI	Other complication

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Demographics

Demographics	No-ORIF	ORIF	p.overall
	N=510	N=510	
Age	58.5 [49.0;69.8]	59.0 [48.4;68.0]	0.845
Sex:			0.237
Female	135 (26.5%)	153 (30.0%)	
Male	375 (73.5%)	357 (70.0%)	
Race:			0.743
African American	50 (9.80%)	40 (7.84%)	
Asian	4 (0.78%)	4 (0.78%)	
Caucasian	436 (85.5%)	446 (87.5%)	
Multiracial/Other	20 (3.92%)	20 (3.92%)	

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Injury Status

Demographics	No-ORIF	ORIF	p.overall
	N=510	N=510	
GCS	15.0 [15.0;15.0]	15.0 [15.0;15.0]	0.107
ISS	17.0 [11.0;24.0]	17.0 [11.0;24.0]	0.612
Head/Neck AIS	2.00 [2.00;3.00]	2.00 [2.00;3.00]	0.561
Chest AIS	3.00 [3.00;3.00]	3.00 [3.00;4.00]	0.079
Abdomen AIS	2.00 [2.00;3.00]	2.00 [2.00;3.00]	0.522
Extremity AIS	2.00 [2.00;3.00]	2.00 [2.00;2.00]	0.106

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Comorbidities

Comorbidities	No-ORIF	ORIF	p.overall
	N=510	N=510	
Smoker:			0.422
No	338 (66.3%)	351 (68.8%)	
Yes	172 (33.7%)	159 (31.2%)	
COPD:			0.46
No	478 (93.7%)	471 (92.4%)	
Yes	32 (6.27%)	39 (7.65%)	
CHF:			1
No	496 (97.3%)	495 (97.1%)	
Yes	14 (2.75%)	15 (2.94%)	
Hypertension:			0.948
No	322 (63.1%)	320 (62.7%)	
Yes	188 (36.9%)	190 (37.3%)	

Comorbidities	No-ORIF	ORIF	p.overall
	N=510	N=510	
Chronic Renal Failure:			1
No	509 (99.8%)	509 (99.8%)	
Yes	1 (0.20%)	1 (0.20%)	
Diabetes:			0.858
No	439 (86.1%)	436 (85.5%)	
Yes	71 (13.9%)	74 (14.5%)	
MI:			1
No	510 (100%)	509 (99.8%)	
Yes	0 (0.00%)	1 (0.20%)	

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Significant Outcomes

Outcomes	No-ORIF	ORIF	p.overall
	N=510	N=510	
Death:			<0.001
No	469 (92.0%)	503 (98.6%)	
Yes	41 (8.04%)	7 (1.37%)	
Death/Hospice Care:	+ 6	+ 1	<0.001
No	463 (90.8%)	502 (98.4%)	
Yes	47 (9.22%)	8 (1.57%)	
ICU Days (n = 653)	5.00 [2.5;11.0]	6.00 [4.00;11.0]	0.001
HLOS Days	6.00 [3.00;11.0]	10.0 [7.00;15.0]	<0.001
Ventilator Days (n = 333)	5.00 [2.00;9.00]	7.00 [3.00;14.0]	0.002

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Insignificant Outcomes

ARDS:	No-ORIF	ORIF	0.836
No	497 (97.5%)	499 (97.8%)	
Yes	13 (2.55%)	11 (2.16%)	
Pneumonia:			0.421
No	459 (90.0%)	450 (88.2%)	
Yes	51 (10.0%)	60 (11.8%)	
VAP:			0.052
No	396 (96.6%)	477 (93.5%)	
Yes	14 (3.41%)	33 (6.47%)	
Unplanned Intubation			0.789
No	479 (93.9%)	482 (94.5%)	
Yes	31 (6.08%)	28 (5.49%)	

ARDS:	No-ORIF	ORIF	0.836
No	497 (97.5%)	499 (97.8%)	
Yes	13 (2.55%)	11 (2.16%)	
Pneumonia:			0.421
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VAP:			0.052
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Yes	14 (3.41%)	33 (6.47%)	
Unplanned Intubation			0.789
No	479 (93.9%)	482 (94.5%)	
Yes	31 (6.08%)	28 (5.49%)	

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Geriatric Sub-Analysis

Outcomes	No-ORIF	ORIF	p.overall
	N=163	N=151	
Death:			0.101
No	151 (92.6%)	147 (97.4%)	
Yes	12 (7.36%)	4 (2.65%)	
Death/Hospice Care:	+ 4	+ 1	0.038
No	147 (90.2%)	146 (96.7%)	
Yes	16 (9.82%)	5 (3.31%)	
ICU Days (n = 197)	5.00 [2.5;10.5]	6.00 [4.00;10.0]	0.027
HLOS Days	5.00 [3.00;10.0]	10.0 [7.00;14.5]	<0.001

MTQIP Presentation

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Flail Chest

Outcomes	No-ORIF	ORIF	p.overall
	N=65	N=237	
Death:			<0.001
No	52 (80.0%)	234 (98.7%)	
Yes	13 (20.0%)	3 (1.27%)	
Death/Hospice Care:			<0.001
No	48 (73.8%)	233 (98.3%)	
Yes	17 (26.2%)	4 (1.69%)	
Cardiac arrest:			0.001
No	58 (89.2%)	234 (98.7%)	
Yes	7 (10.8%)	3 (1.27%)	
ICU Days (n = 230)	7.00 [2.5;10.0]	7.00 [4.00;14.0]	0.03
HLOS Days	9.00 [3.00;13.0]	11.0 [8.00;17.0]	<0.001
Ventilator Days (n = 122)	3.00 [2.0;9.0]	9.00 [3.0;14.5]	0.002

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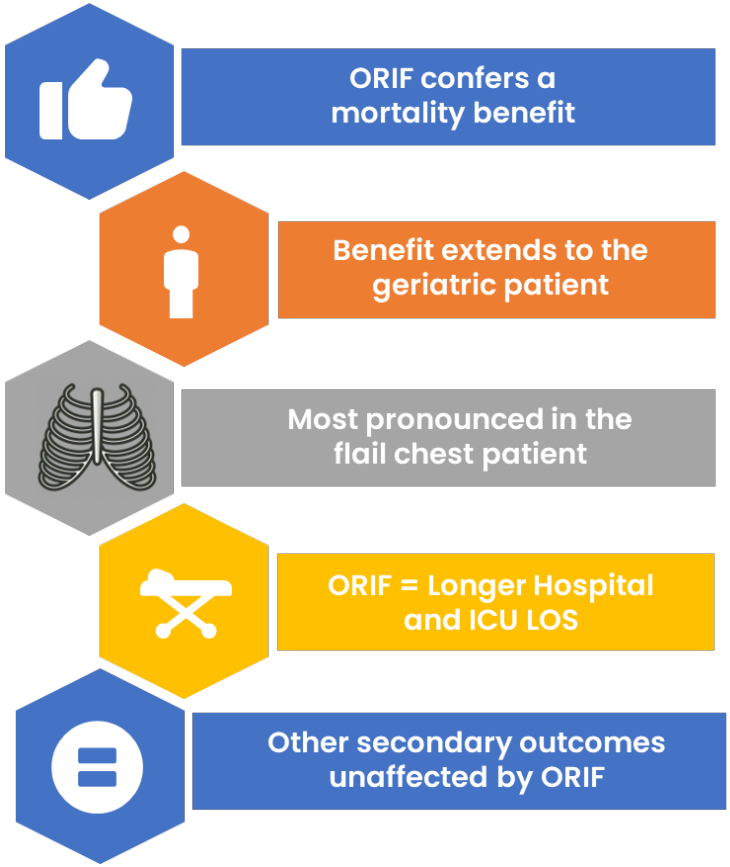
Overall Findings



No-ORIF: 9.22% ORIF: 1.57%	p<0.001
No-ORIF: 9.82% ORIF: 3.31%	p<0.001
No-ORIF: 26.2% ORIF: 1.69%	p<0.001
HLOS No-ORIF: 6 days HLOS ORIF: 10 days	p<0.001
Pulmonary outcomes same	

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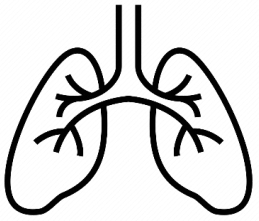
Discussion

Findings support the role of ORIF in trauma patients

Reinforces the broadly accepted benefit in flail chest patients

Contributes to a growing body of evidence that ORIF should be considered in the geriatric patient



ORIF does not appear to impact pulmonary outcomes (VAP, PNA, ARDS)
Why the mortality benefit?

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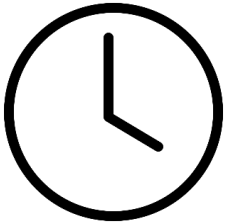
Discussion

Hospice use is very low in the operative group

Are mortality statistics impacted by desire to be aggressive and not ORIF alone?



LOS outcomes across the literature vary

Longer LOS may be due to 17% of patients getting ORIF > 72 hours

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Limitations

Retrospective study

Cannot evaluate the impact of plating on pain control

No insight into quality-of-life outcomes

Heterogeneous indications for ORIF

Cannot specifically evaluate rib fracture pattern

Did not measure differences over time (2013 vs 2022)

Did not specifically evaluate non-flail

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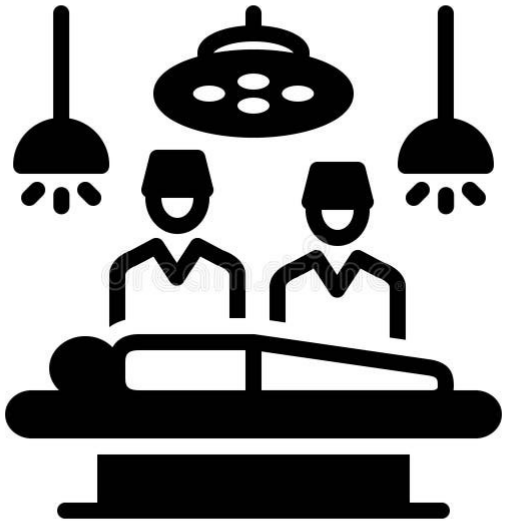
Recommendation



ORIF should be considered as a treatment modality in the polytrauma patient

Survival benefit justifies the costs associated with Increased LOS

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