Journal Reading: EBM

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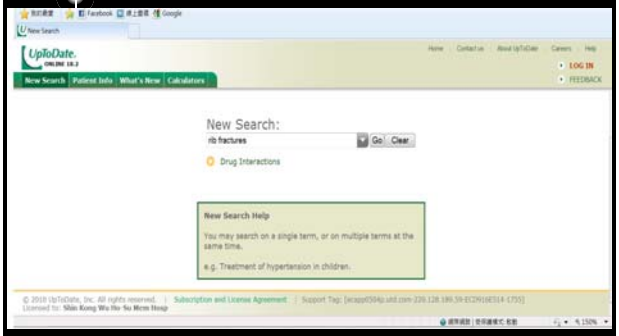
Scenario

- 45歲男性工人從三層樓高的鷹架跌落，右側有5根肋骨骨折，頭皮上有hematoma，但brain CT沒有ICH。到ER時的SpO_2 = 92，其餘vital signs正常，病患覺得右後背痛，但不太會喘。

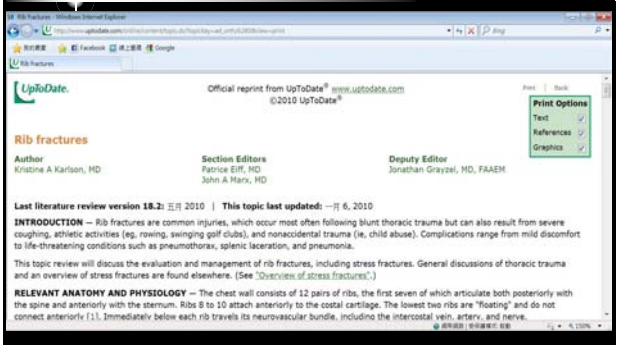
臨床問題

1. 肋骨骨折需要住院嗎？是斷超過幾根以上需要住院？還是要合併什麼傷勢才要住院？台灣健保有住院條件嗎？
2. 肋骨骨折數目的多寡（或單純有無肋骨骨折）跟病患的mortality有關嗎？跟morbidity有關嗎？有沒有其他的交互作用因子？（例如年紀）

文獻搜尋



文獻搜尋



summary

- 3 groups of ribs:
  - Superior (1-3): protected by scapula, clavicle, soft tissue
  - Middle (4-10): most susceptible to injury
  - Inferior (11-12): floating rib
- Mechanism of rib fracture
  - Direct trauma: blunt or penetrating
  - Traumatic fracture: at the site of impact or the posterolateral bend
  - Pathologic fracture: prostate, breast and renal cancer
  - Stress fractures: severe cough, athletes
  - Child abuse

summary

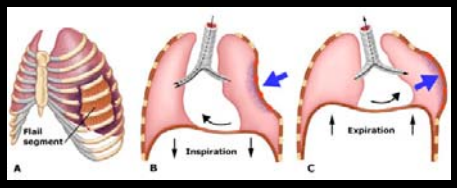
- Symptom/signs
  - Local pain
  - Severe point tenderness
  - Bony crepitance
  - Ecchymosis
  - Diminished breath sounds: due to pain, pneumothorax, pulmonary contusion

summary

Fracture in ribs	Extrapulmonary internal injury	
1-3	Mediastinal injury (esp. aorta)	Intrathoracic injury, e.g. pneumothorax, pulmonary contusion
4-9		
10-12	Intraabdominal injury	

Flail chest

- ≥ 3 adjacent ribs, each fractured in 2 places
- Paradoxical motion in respiration



Treatment of rib fracture

- Pain control!
  - NSAID, opioids
  - Intercostal nerve blocks, epidural blocks, transcutaneous electrical nerve stimulation (TENS)
- Treat the complication
- Admission
  - Any patient with ≥ 3 rib fractures
  - Elderly patients with ≥ 6 rib fractures → ICU
  - Evidence level: Evidence Guideline, level V (?)

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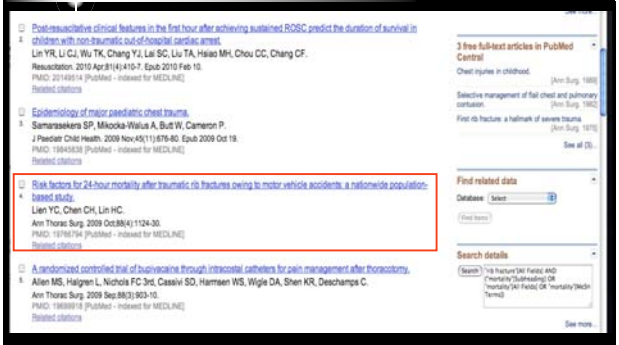


Paper 1

Ann Thorac Surg. 2009 Oct;88(4):1124-30.

Risk factors for 24-hour mortality after traumatic rib fractures owing to motor vehicle accidents: a nationwide population-based study.

Lien YC, Chen CH, Lin HC.
Division of Thoracic Surgery, Department of Surgery, Taipei Medical University and Hospital, Taipei, Taiwan.

- methods:
  - 18856 patients hospitalized with rib fractures after TA; 2002-2004; data from Taiwan's National Health Insurance Research Database
  - multivariate logistic regression
  - 24-hr mortality, patients' age, sex, comorbid conditions, hospital characteristics

Results

Variables	Totals		Deceased Within 24 Hours				p Value
			Yes		No		
	No.	Column %	No.	Row %	No.	Row %	
Patient characteristics							
Patient sex							0.923
Male	13,217	70.1	311	2.4	12,906	97.6	
Female	5,639	29.9	134	2.4	5,505	97.6	
Patient age (y)							<0.001
18–44	5,307	28.1	90	1.7	5,217	98.3	
45–64	8,470	44.9	161	1.9	8,309	98.1	
65–74	3,235	17.2	95	2.9	3,140	97.1	
≥74	1,844	9.8	99	5.4	1,745	94.6	
Hospital characteristics							
Hospital level							<0.001
Medical center	3,938	20.9	99	2.5	3,839	97.5	
Regional hospital	6,883	47.1	249	2.8	6,634	97.2	
District hospital	6,035	32.0	97	1.6	5,938	98.4	
Hospital ownership							0.588
Public	4,005	21.2	94	2.4	3,911	97.6	
Private not-for-profit	7,340	38.9	183	2.5	7,157	97.5	
Private for-profit	7,511	39.8	168	2.2	7,343	97.8	0.207
Hospital location							
Northern	5,579	29.6	120	2.2	5,459	97.9	
Central	6,045	32.1	163	2.7	5,882	97.3	
Southern	6,739	35.7	150	2.2	6,589	97.8	
Eastern	493	2.6	12	2.4	481	97.6	

Conclusion

- ≥ 6 rib fracture, heart injuries, hepatic injuries, head injuries, and advanced age are the most important determinants of 24-hr mortality after thoracic trauma from TA.
- Evidence level: III

Paper 2

Eur J Cardiothorac Surg. 2003 Jul;24(1):133-8.

A comprehensive analysis of traumatic rib fractures: morbidity, mortality and management.

Sirmali M, Türüt H, Topçu S, Gülhan E, Yazici U, Kaya S, Taştepe I.
Department of Thoracic Surgery, Atatürk Training and Research Hospital for Chest Disease and Chest Surgery, Ankara, Turkey. mehmetsirmali@yahoo.com

- methods
  - between 1999-2001
  - •1417 patients with thoracic trauma

Results

Table 1
Occurrence of pulmonary complications associated with the types of trauma

	Pneumothorax	Hemothorax	Hemo-pneumothorax	Lung contusion	Flail chest	Isolated subcutaneous emphysema
Motor vehicle	93	69	30	57	18	2
Falls	44	24	15	26	7	6
Assault	20	13	10	6	1	4
Industrial accidents	14	10	7	5	6	

Table 2
Association between the types of the traumas, pulmonary complications and median injury severity score (ISS)

	Pneumothorax	Hemothorax	Hemo-pneumothorax	Lung contusion	Flail chest	Isolated subcutaneous emphysema
Motor vehicle	16	17	17	19	26	12
Falls	13	14	13	15	23	10
Assault	12	12	11	12	19	9
Industrial accidents	15	16	17	18	25	

Results

Table 3
Relationship between the ages and pulmonary complications of the cases

Age group	Pneumothorax	Hemothorax	Hemo-pneumothorax	Lung contusion	Flail chest	Isolated subcutaneous emphysema
Child ($n = 68$)	14	8	7	21	–	1
Adolescent ($n = 103$)	40	28	16	23	–	2
Adult ($n = 235$)	92	79	37	32	18	6
Elderly ($n = 142$)	58	32	24	18	14	3
Total ($n = 548$)	204	147	84	94	32	12

Table 4
Relationship between the number of fractured ribs and number of pulmonary complications of the cases

No. of fractured ribs	Pneumothorax	Hemothorax	Hemo-pneumothorax	Lung contusion	Flail chest	Isolated subcutaneous emphysema
1–2	34	25	7	15	–	9
3–5	67	45	25	32	12	3
6 or more	103	77	42	47	20	–
Total	204	147	74	94	32	12

Conclusions

- The greater the number of fractured ribs, the higher the mortality and morbidity rates.
- ≥ 3 rib fractures: admission to general ward
- Elderly with ≥ 6 rib fractures: ICU
- Evidence level: III

Paper 3

Surgery. 2005 Oct;138(4):717-23; discussion 723-5.

Half-a-dozen ribs: the breakpoint for mortality.

Flagel BT, Luchette FA, Reed RL, Esposito TJ, Davis KA, Santaniello JM, Gamelli RL.

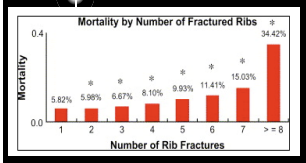
Division of Trauma, Critical Care, and Burns, Department of Surgery, Burn Shock Trauma Institute, Stritch School of Medicine, Loyola University Medical Center, Maywood, Illinois, USA.

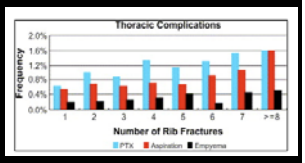
- methods
  - the National Trauma Data Bank (NTDB)
  - 731823 patients with at least 1 rib fracture
  - to analyze: the number of rib fractures, injury severity score, pneumonia, ARDS, PE, pneumothorax, aspiration pneumonia, empyema, the need for ventilator….

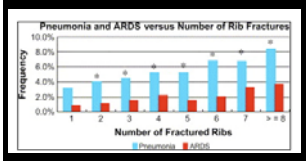
Results

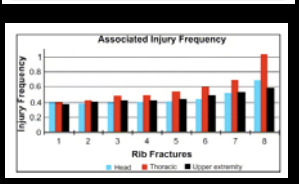
ICD-9 code				AIS code				Either ICD-9 or AIS code		
No. of rib fractures	No. of cases	Total	Mortality	No. of rib fractures (grouped)	No. of cases	Total	Mortality	No. of cases	Total	Mortality
1	15,613	24.15%	5.82%	1	10,651	22.35%	5.82%	16,001	23.80%	5.74%
2	9,784	15.13%	5.98%							
3	7,482	11.57%	6.67%	2-3	18,484	38.78%	7.90%	23,980	35.67%	7.46%
4	4,784	7.40%	8.10%	4-6	8,709		13.54%	12,081	17.97%	11.73%
5	2,824	4.37%	9.93%							
6	1,771	2.74%	11.41%							
7	1,114	1.72%	15.03%							
≥8	1,994	3.08%	34.42%	>6	1,729	3.63%	42.36%	2,738	4.07%	32.96%
Unspecified	19,295	29.84%	14.65%	Unspecified	8,085	16.96%	19.24%	12,421	18.48%	18.03%
Totals	64,661	100.00%	10.12%	Totals	47,658	100.00%	11.64%	67,221	100.00%	10.79%

Results

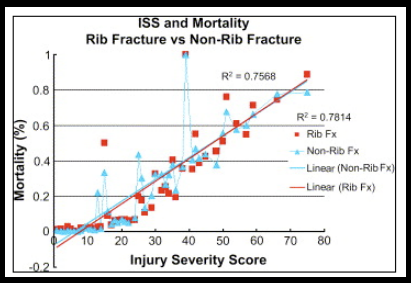






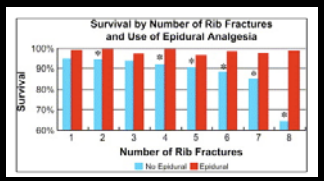


Results



Mortality was not effected by the rib fracture alone.

Results



Conclusion

- Mean hospital length of stay (LOS): 7 days, ICU LOS: 4 days
- Increasing the number of rib fractures correlated directly with increasing pulmonary morbidity and mortality.
- ≥ 6 rib fractures → significant risk for death from causes unrelated to the rib fractures.
- Epidural analgesia: reduce the mortality for all patients (esp. > 4 rib fractures)
- Evidence III

Paper 4

J Trauma. 2000 Jun;48(6):1040-6; discussion 1046-7.

Rib fractures in the elderly.

Bulger EM, Arneson MA, Mock CN, Jurkovich GJ.

Harborview Medical Center, Seattle, Washington 98104-2499, USA. ebulger@u.washington.edu

- A retrospective cohort study
- 277 patients, ≧65 y/o with rib fractures
- Control: 187 patients, 18-64 y/o with rib fractures
- Outcomes: pulmonary complications, number of ventilator days, length of ICU and hospital stay (LOS), mortality…

Results

	≧ 65 y/o	18-64 y/o
Mean number of rib fracture	3.6	4
Mean chest abbreviated injury score	3	3
Mean injury severity score	20.7	21.4
Mean number of ventilator days	4.3	3.1
ICU days	6.1	4.0
LOS	15.4	10.7
pneumonia	31 %	17 % (p<0.01)
mortality	22 %	10 % (p<0.01)

Results

- The mortality rate in patients with LOS > 2 days:

	Use epidural analgesia	Did NOT use
≧ 65 y/o	10 %	16 %
18-64 y/o	0 %	5 %

Conclusions

- Elderly: twice the mortality and thoracic morbidity
- ↑ 1 rib fracture in the elderly, ↑ 19 % mortality and ↑ 27 % risk of pneumonia
- Evidence level: III

健保相關規定

健保相關規定

- 肋骨骨折，如病人年紀大、病人有心肺疾病、骨折數目3根或大於3根、伴隨有其他合併症(如連枷胸)、住進ICU、使用呼吸器，會有較長的住院天數
- 一般肋骨骨折，在一星期後，有fibrous union形成，疼痛較容易控制
- 急性期可使用oral NSAID，IV Keto或PCA治療

健保相關規定

93年1月至12月資料

主診斷代碼	資料	單純性肋骨骨折			肋骨骨折合併其他診斷		
		非交通事故			非交通事故		
		交通事故	故	總計	交通事故	故	總計
80701	個案數	10	25	35	58	143	201
	平均天數	3.4	3.2	3.3	4.1	4.5	4.4
80702	個案數	5	25	30	39	134	173
	平均天數	3.2	2.7	2.8	4.4	4.7	4.7
80703	個案數	5	12	17	43	106	149
	平均天數	4.2	3.7	3.8	4.7	6.2	5.7
80704	個案數	3	10	13	25	59	84
	平均天數	5.3	3.6	4	6.4	8.0	7.5
80705	個案數	2	7	9	31	37	68
	平均天數	3.5	5	4.7	6.3	10.4	8.5
80706	個案數	1	4	5	8	14	22
	平均天數	4	5	4.8	4.9	11.1	8.8
80707	個案數		1	1	1	4	5
	平均天數		4	4	15	8.75	10
80708	個案數				3	8	11
	平均天數				16	13.1	13.9
80709	個案數		2	2	4	33	37
	平均天數		5.5	5.5	8.5	12.9	12.5
加總/個案數 的加總		26	86	112	212	538	750
平均健/急性病床天數 的加總		3.8	3.5	3.5	5.2	6.5	6.1

Grading for recommendations

- Admission duration: 3.5-6.1 days
- Use the number of rib fracture, patient's age and concurrent injury (i.e. heart, liver, head) to predict the morbidity and mortality
- Use epidural analgesia to reduce the mortality
- Clinical recommendation: group C

Thank you for your attention!