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ORIGINAL CONTRIBUTION

Increases in Emergency Department Occupancy Are Associated With Adverse 30-day Outcomes

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Background

- 急診病人擁擠程度是否會影響醫療品質。
- 急診的擁擠定義: 急診室處理病人超過合理的時間
- 擁擠的情況可能造成
 - 病人等待過久而自動辦理離院(在仍需要治療的狀況下)
 - 延長住院時間
 - 院內死亡率增加
 - 放回家病人的短期死亡率及返診住院率上升
- 擁擠的狀況原因
 - 無法及時收住院
 - 病人於急診等待時間延長

Objective

- 急診病人擁擠程度 vs 病人疾病預後之相關性
- 這篇研究包含了其他許多不同大小的急診室進行其相關性實驗分析，並包含了進一步分析不同急診室之特性【大小】、【分類】、【醫師/護理人員比例】對其相關性之影響。

Method

- 回溯性世代研究法
- 個案收集 – 110 間急診室
 - 2005, Quebec, Canada
 - 非精神醫院
- Relative occupancy ratio – 以個別急診室 年平均每日人數去做比較
- Primary outcome - 1st ED visits 後30 days
 - 1. 住院中死亡
 - 2. 返診
 - 3. 1st 返診住院
- Secondary outcome – 急診床數、醫護人力配置、城鄉位置與之擁擠程度之關聯性

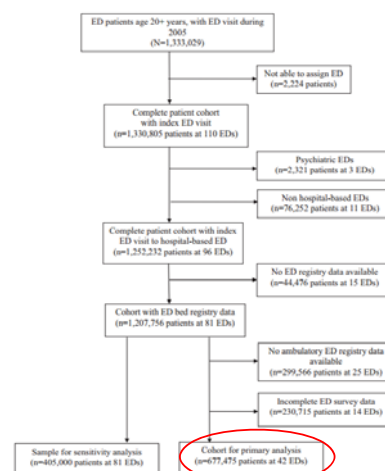


Table 1
ED Characteristics and Size/Type (N = 42)

Characteristic	Large ED (n = 17)	Medium ED (n = 17)	Small ED (n = 8)
Level of care			
Tertiary or specialized	11 (64.7)	1 (5.9)	0 (0.0)
Secondary	6 (35.3)	15 (88.2)	1 (2.3)
Primary	0 (0.0)	1 (5.9)	22 (50.0)
Other	0 (0.0)	0 (0.0)	21 (47.7)
University affiliation			
Yes	13 (76.5)	9 (52.9)	1 (12.5)
No	4 (23.5)	8 (47.1)	7 (87.5)
Number of licensed ED beds			
Very low (1-6)	0 (0.0)	0 (0.0)	1 (12.5)
Low (7-13)	0 (0.0)	6 (35.3)	6 (75.0)
High (14-20)	3 (17.7)	8 (47.1)	1 (12.5)
Very high (20+)	14 (82.4)	3 (17.7)	0 (0.0)
Mean (±SD)	34.2 (±11.2)	15.4 (±4.9)	8.9 (±4.8)
Geographic location			
Montreal/Laval	17 (100.0)	6 (35.3)	2 (25.0)
Other urban	0 (0.0)	11 (64.7)	4 (50.0)
Rural	0 (0.0)	0 (0.0)	2 (25.0)

Data are reported as n (%) or mean (±SD).

Result

Table 2
Characteristics of Hospital-based EDs by Study Inclusion (N = 96)

ED Characteristics	Cohort for Pri- mary Analysis (n = 42)		Included for Sensi- tivity Analysis (n = 39)		Excluded (n = 15)		p-value ANOVA
	Mean	(±SD)	n	Mean (±SD)	n	Mean (±SD)	
Number of licensed ED beds	21.8	(±13.3)	39	16.6 (±11.5)	15	4.1 (±2.2)	<.0001
Average number of doctors per shift	3.0	(±2.1)	17	2.9 (±2.7)	8	2.3 (±2.1)	0.666
Average number of nurses per shift	13.1	(±8.3)	31	9.8 (±7.4)	9	2.8 (±1.0)	0.001
Daily average bed occupancy*	24.6	(±17.3)	39	19.5 (±16.0)	0		0.173
Daily average ambulatory occupancy*	11.5	(±6.0)	15	17.4 (±15.2)	0		0.167
Daily total average occupancy*	36.1	(±21.6)	15	43.2 (±27.0)	0		0.312
Geographical location	n	(%)	n	(%)	n	(%)	Chi-square
Metropolitan	25	(59.5)	16	(41.0)	0	(0)	<.0001
Urban	15	(35.7)	10	(25.6)	1	(6.7)	
Rural	2	(4.8)	13	(33.3)	14	(93.3)	
Composite measures							
ED size							<.0001
Small	8	(19.5)	14	(35.9)	10	(100.0)	
Medium	17	(40.5)	12	(30.8)	0	(0.0)	
Large	17	(40.5)	13	(33.3)	0	(0.0)	
Doctor:patient ratio							NA
Low (<0.3)	11	(26.2)	1	(50.0)	0		
Medium (0.3-0.42)	20	(47.6)	1	(50.0)	0		
High (0.43-)	11	(26.2)	0	(0.0)	0		
Nurse:patient ratio							0.960
Low (<0.06)	10	(23.8)	3	(27.3)	0		
Medium (0.06-0.11)	21	(50.0)	5	(45.5)	0		
High (0.12-)	11	(26.2)	3	(27.3)	0		

N/A = not applicable; the sample in the excluded group is too small.

*Computed over 1 year of data (calendar year 2005).

†Including auxiliary nurses and orderlies.

Result

Table 3
Relationship of ED Bed Relative Occupancy Ratio to 30-day Outcomes Among 677,475 Patients Visiting 42 EDs in 2005

Outcomes by ED Bed Relative Occupancy Ratio	n with outcome	% with outcome	Univariate models			Multivariable models*			Pseudo R ²
			OR	95% CI	p-value	OR	95% CI	p-value	
Death (N = 677,475)	12,994	1.8	1.06	1.05-1.07	<.0001	1.03	1.02-1.04	<.0001	0.43
ED return visit among discharged patients (n = 577,696)	67,155	12.1	1.00	0.99-1.01	0.150	1.00	0.99-1.00	0.036	0.06
Admission at ED return visit (n = 67,155)	11,479	15.6	1.04	1.03-1.05	<.0001	1.03	1.01-1.04	<.0001	0.19

Random intercept is included to model the effect of ED.

OR was computed for an increase of 10% in relative occupancy ratio.

*Multivariable: adjusted for patient baseline characteristics (age, sex, urban vs. rural residence, socioeconomic status, long-term care residence, hospital days, GP and specialist office or clinic visits, ED visits, multimorbidity, previous mental health diagnosis), index visit characteristics (diagnosis/es, weekend vs. weekday, and season), and the three composite ED measures (ED size/type, physician:patient ratio, and nurse:patient ratio). OR = odds ratio.

Result

Table 4
Relationship of ED Waiting Room Occupancy Ratio to 30-day Outcomes Among 677,475 Patients Visiting 42 EDs in 2005

Outcomes by ED Waiting Room Occupancy Ratio	n with Outcome	% with Outcome	Univariate Models			Multivariable Models*			Pseudo R ²
			OR	95% CI	p-value	OR	95% CI	p-value	
Death (N = 677,475)	12,994	1.8	1.00	0.99-1.01	0.611	1.00	0.99-1.01	0.266	0.43
ED return visit [†] among discharged patients (n = 577,696)	67,155	12.1	0.99	0.98-0.99	<.0001	0.99	0.99-1.00	<.0001	0.06
Admission at ED return visit (n = 67,155)	11,479	15.6	1.00	0.99-1.01	0.472	1.00	0.99-1.01	0.789	0.19

Random intercept is included to model the effect of ED.

OR was computed for an increase of 10% in relative occupancy ratio.

*Multivariable: adjusted for patient baseline characteristics (age, sex, urban vs. rural residence, socioeconomic status, long-term care residence, hospital days, GP and specialist office or clinic visits, ED visits, multimorbidity, previous mental health diagnosis), index visit characteristics (diagnosis/es, weekend vs. weekday, and season), and the three composite ED measures (ED size/type, physician:patient ratio, and nurse:patient ratio). OR = odds ratio.

Conclusion

- 急診室床位擁擠程度↑ 30-day mortality rate↑
 - 住院病人
 - 第一次返診後住院病人
- 大型急診室有著較顯著的相關一致性
- 候診室擁擠程度無關 30-day mortality rate

Discussion

- 床位擁擠率與 30-day mortality/1st 返診住院直接相關性
 - 存在著針對病情較嚴重的病人較為相關之可能性
- 佔床擁擠率上升有著不容忽視的病人安全之影響力
- 等待時間增加可能會讓病情嚴重的人延遲返診之意願
- 佔床擁擠率上升可能導致嚴重病人無法及時住院
- 擁擠程度造成醫師的無形壓力導致嚴重病人被輕率放回家的機率上升

Discussion

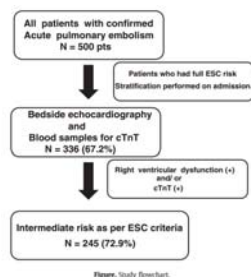
- 候診室病人擁擠率上升會造成的返診率增加的影響但是並不大。
- 這次的研究有助於未來政策以減少急診擁擠的現象，如加強社區及居家醫療照護等等。
- 在特別擁擠的時段，應用更審慎的態度放病人回家。
- 不同的醫院急診室可針對不同的面向去改善急診擁擠程度。

Background

- Acute pulmonary embolism (APE) – 危及生命、造成許多complications
 - 需早期診斷及治療
- 胸痛病人在急診會先做 EKG – 但是
 - low sensitivity, specificity for APE
 - 造成延遲的診斷及治療
- APE mortality rate (by European recommendations on management of APE)
 - High risk - >15%
 - Intermediate risk – 3~15%
 - Low risk - < 1%
- European Society of Cardiology – 2 預後因子
 - Presence of RV dysfunction
 - ↑ cardiac enzymes (troponin-I)
- Ischemic EKG pattern –
 - TWI, ST-D, ST-E or aVR STE combining lateral leads STD

Method

- 回溯性研究分析APE Patient in 7 間社區醫院心臟內科病房 from 2005 ~ 2012



Original Contribution

Use of ischemic ECG patterns for risk stratification in intermediate-risk patients with acute PE☆☆☆

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Objective

- 探討是否能夠以心電圖缺氧的訊號→評估 risk of complication or death in APE patient

Method

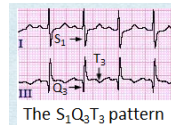
Table 1
Clinical and demographic characteristics of a population of intermediate-risk patients diagnosed with APE

Characteristic	Value
Age, y	67.7 ± 14.4
Female	142 (57.9%)
Angina	108 (44.0%)
Syncope	57 (23.2%)
Obesity	62 (25.3%)
Immobilization	51 (20.8%)
Thrombophlebitis	101 (41.2%)
Hemoptysis	5 (2.0%)
Malignancy	28 (11.4%)
Oral contraception	5 (2.0%)
CHF class NYHA II-IV	34 (13.9%)
COPD	21 (8.6%)
Fever	34 (13.9%)

Abbreviations: COPD, chronic obstructive pulmonary disease; CHF, congestive heart failure; NYHA, New York Heart Association.

Method

- EKG 分析 – 5 patterns
 - 1. ST-segment ischemic pattern (STIP)
 - 至少1 lead ST-E in aVR, III, V1-V4
 - 或 ST-D in 2 lateral leads (I, aVL, V4-6)
 - 2. Global ischemic pattern (GIP)
 - 至少1 lead ST-E in lead III, aVR, V-4
 - 加上 ST-D in 2 lateral leads (I, aVL, V4-6)
 - 3. Negative T wave pattern (NTW)
 - 不符合前兩項 STIP/GIP
 - 至少2 leads with TWI in inferior leads (II,III, aVF)
 - 加上至少2個TWI in leads (V1-V4)
 - 4. 無以上缺氧波形
 - 5. S1Q3T3 sign - 典型PE EKG signs
 - Right heart strain



The S₁Q₃T₃ pattern

Result

Table 2

Predictors of in-hospital death in a population of intermediate-risk patients diagnosed with APE, according to a univariate regression analysis

	Death (-)	Death (+)	OR (95% CI)	P
Age, y	67.6	68.8	1.06 (0.70-1.61)	.777
Diastolic BP, mm Hg	82.3	72.7	0.53 (0.32-0.9)	.018
cTnT (+)	58.8%	91.7%	6.80 (1.28-169)	.021
RVD (+)	85.4%	100.0%	4.32 (0.25 - 77.8)	.321
S1Q3T3 sign	25.8%	66.7%	5.61 (1.67-22.5)	.005
NTW	12.4%	8.3%	0.72 (0.03-3.97)	.126
GIP	13.3%	25.0%	2.23 (0.45-8.13)	.291
STIP	42.5%	83.3%	6.35 (1.6-46.0)	.007
No ischemic changes	44.6%	8.33%	0.13 (0.01-0.68)	.012

Abbreviations: BP, blood pressure; cTnT (+), positive troponin.

Result

Table 3

Predictors of in-hospital complications for patients presenting with an APE, according to univariate regression analysis

	Complications (-)	Complications (+)	OR (95 % CI)	P
Age, y	68.2	62.8	0.79 (0.60-1.03)	.082
Diastolic BP, mm Hg	82.4	76.0	0.66 (0.46-0.95)	.025
S1Q3T3 sign	25.8%	45.8%	2.43 (1.00-5.79)	.049
cTnT (+)	57.5%	87.5%	4.94 (1.63-22.3)	.003
RVD (+)	86.0%	87.5%	1.10 (0.35 - 5.06)	.887
NTW	13.1%	4.1%	0.33 (0.01-1.65)	.211
GIP	13.6%	16.7%	1.31 (0.35-3.79)	.659
STIP	41.2%	75.0%	4.19 (1.67-12.1)	.002
No ischemic changes	45.2%	20.8%	0.33 (0.10-0.85)	.021

Abbreviations: BP, blood pressure; cTnT, troponin T concentration.

Result

Table 4

Mortality rate according to combinations of different ischemic patterns and presence of RVD or cTnT in a population of patients with APE

	STIP (+)	STIP (-)	GIP (+)	GIP (-)	NTW (+)	NTW (-)	No changes (+)	No changes (-)
RVD (+) and cTnT (+)	9 (14.1%)	2 (3.7%)	2 (11.1%)	9 (9.0%)	1 (6.7%)	10 (9.7%)	1 (2.6%)	10 (12.5%)
OR	3.99 (0.95-29.8)		1.33 (0.17-5.92)		0.74 (0.03-4.46)		0.21 (0.01-1.21)	
P	.002		.749		.787		.902	
RVD (+)	10 (11.4%)	2 (3.6%)	3 (12.5%)	9 (4.8%)	1 (3.6%)	11 (6.0%)	1 (1.0%)	11 (9.4%)
OR	7.26 (1.82-52.8)		2.89 (0.5-10.8)		0.65 (0.03-1.61)		0.12 (0.00-0.63)	
P	.004		.177		.681		.008	
cTnT (+)	9 (10.7%)	2 (3.1%)	2 (7.4%)	9 (7.4%)	1 (6.2%)	10 (7.6%)	1 (2.1%)	10 (9.9%)
OR	3.50 (0.84-25.9)		1.05 (0.14-4.50)		0.91 (0.03-5.40)		0.22 (0.01-1.24)	
P	.080		.955		.953		.096	

Abbreviation: cTnT (+), elevated troponin concentration.

Table 5

Rate of mortality, complications, and positive troponin according to type of ischemic pattern in ECG on admission in a population of patients with APE

	GIP (+)	GIP (-)	STIP (+)	STIP (-)	No changes (+)	No changes (-)	NTW (+)	NTW (-)
Death	3 (8.82%)	9 (4.27%)	10 (9.17%)	2 (1.47%)	1 (0.95%)	11 (7.86%)	11 (5.12%)	1 (3.33%)
OR	2.25 (0.45-8.13)		6.35 (1.60-46.0)		0.13 (0.01-0.66)		0.72 (0.03-3.97)	
P	.29		.007		.012		.75	
Complications	4 (11.8%)	20 (9.48%)	18 (16.5%)	6 (4.41%)	3 (4.76%)	19 (13.6%)	1 (3.33%)	23 (10.7%)
OR	1.31 (0.35-3.79)		4.19 (1.67-12.1)		0.33 (0.10-0.85)		0.33 (0.01-1.65)	
P	.05		.003		.001		.21	
cTnT (+)	27 (79.4%)	121 (57.3%)	84 (77.1%)	64 (47.1%)	47 (44.8%)	101 (72.1%)	16 (53.3%)	132 (64.4%)
OR	2.81 (1.23-7.36)		3.75 (2.10-6.66)		0.31 (0.10-0.93)		0.72 (0.33-1.58)	
P	.013		<.001		.001		.45	

Abbreviation: cTnT (+), elevated troponin concentration.

Conclusion

- APE 病人之入院心電圖缺氧訊號→預測出in-hospital worse outcome.
- 加上心電圖的缺氧訊號，我們能夠從廣大的intermediate risk病人中更精確的篩選出真正會住院中mortality 或是產生complication 的病人。

Discussion

- APE intermediate risk的病人涵蓋了一個很廣闊的mortality rate範圍(3~15%)
- 目前EKG上的變化還沒有廣泛接受為PE病人的風險評估工具
- 最有用的EKG parameter
 - STIP → mortality (9.17%) & complication (16.5%)
 - No change → mortality (<1%), Complication (<5%)
- RVD + STIP → Mortality rate (11.4%)
- RVD + STIP + Enzyme → mortality rate (14.1%)
 - 但是 p=0.06 (>0.05) → 未來可透過更大規模的研究進一步證實其相關性
- 建議未來能夠將EKG pattern納入現有ESC的PE mortality risk 評估項目之中