Effect of an Independent-capacity Protocol on Overcrowding in an Urban Emergency Department

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- Overcrowding is one of the most significant problems
- Patient dissatisfaction
- Compromise standards of care
- Potentially increases mortality
- **Input Throughput Output Model**

Input

- Building walk-in clinics
- Strengthening primary care systems

Throughput

- New triage systems
- Novel technologies
- Quality assurance programs

Output

- Expanded the scope of the ED
- Build new capacities outside the ED

- Expanding the capacity for admitted patients is one of the major challenges in dealing with overcrowding
- NOT need to be limited to the admitting hospital
  →surrounding community hospitals

New Strategy

- **The independent-capacity protocol (ICP)**
- Without requiring additional hospital resources

METHODS

Study Design

- Before-and-after trial since 2006/07/01 ~ 2008/06/30
- the Seoul National University Hospital

Study Setting and Population

- Urban, tertiary care ED with 45,000 annual visits
- 54 treating beds, 30-bed emergency ward 20-bed emergency ICU
- The ICP was introduced on 2007/07/01

Study Protocol

- Major cause of overcrowding is OUTPUT -- Asplin et al.
- Augmented the potential output to include other community hospitals
- Gave EPs more responsibility and authority over patient disposition

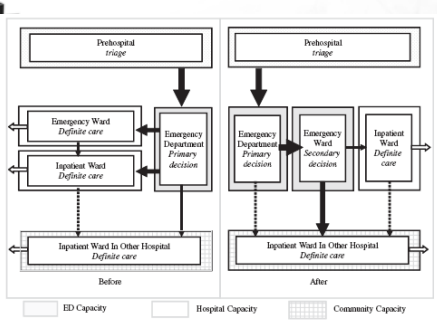


Figure 1. A conceptualized output flow before and after introduction of the independent-capacity protocol (ICP). Before introduction of the ICP, the emergency ward functioned like other inpatient wards. After introduction of the ICP, the emergency ward changed to a place where secondary decision-making for disposition takes place. Dashed lines represent transfers from specific wards to other hospitals that were not analyzed in this study due to small number. Clear arrows represent discharges to home.

- The emergency ward limited its holding period < 48 hours
- the EP, associated specialists, transfer coordinators →determine patient disposition

General principles

- Urgent surgical patients
- Required medical care with special equipment
- Unstable vital signs
- Against patient's will

Measurements

- The national ED information system
- Age, sex, diagnosis, treatment, discharge, admission, in-hospital mortality
- ED length of stay (LOS), the number of admissions to inpatient wards, and the mortality rate

Data Analysis

- chi-square test and the Student's t-test
- the Mann-Whitney U-test for LOS

RESULTS

Table 1
Demographic Findings of Study Population

Variables	Control	Study	Total	p-value
Total visits	41,726	45,583	87,309	<0.001
Daily visits, person/day, median (IQR)	114 (104 to 124)	124 (112 to 135)	119 (108 to 130)	
Female sex, %	19,287 (46.2)	21,015 (46.1)	40,302 (46.2)	0.72
Age group, *n* (%)				
Children (0–15 yr)	10,530 (25.2)	11,032 (24.2)	21,562 (24.7)	<0.001
Adults (16–65 yr)	23,217 (55.6)	25,353 (55.6)	48,570 (55.6)	
Elders (>65 yr)	7,979 (19.1)	9,198 (20.2)	17,177 (19.7)	
Insurance type, *n* (%)				
NHI	37,246 (89.3)	41,414 (90.9)	78,659 (90.1)	<0.001
Motor vehicle insurance	855 (2.05)	859 (1.88)	1,714 (1.96)	
Medical aid	2,255 (5.40)	2,024 (4.44)	4,279 (4.90)	
Without insurance	495 (1.16)	526 (1.15)	1,011 (1.16)	
Other	886 (2.12)	760 (1.67)	1,646 (1.89)	
Mode of arrival, *n* (%)				
Prehospital ambulance service	4,288 (10.1)	4,770 (10.5)	8,998 (10.3)	0.08
Interhospital transfer ambulance	2,333 (5.59)	2,430 (5.33)	4,763 (5.46)	
Other	35,105 (84.3)	38,383 (84.2)	73,548 (84.2)	
Injury, *n* (%)	7,032 (16.9)	7,519 (16.6)	14,551 (16.7)	0.16
Critical patients, *n* (%)				
CPR	48 (0.12)	119 (0.26)	167 (0.19)	<0.001
Intubation	171 (0.39)	271 (0.59)	432 (0.49)	<0.001
Mechanical ventilation	212 (0.51)	170 (0.37)	382 (0.44)	0.003
Visit time characteristics, *n* (%)				
Patients arrived during day time (8:00–18:00)	24,157 (57.9)	25,985 (57.0)	50,142 (57.4)	0.008
Patients arrived on weekdays (Monday–Friday)	30,376 (72.8)	32,982 (72.4)	63,367 (72.6)	0.16

Data are reported as proportion (%) or median (IQR).
CPR = cardiopulmonary resuscitation; IQR = interquartile range; NHI = National Health Insurance.

Table 2
Before/After Control/Study*

Resources	Before	After
Facility		
Treating area (m^2)	1,409.44	1,409.44
Triage beds	3	3
Resuscitation room	2	2
Observation beds	54	54
ICU beds	20	20
Emergency ward beds	30	30
Equipment		
Emergency computed tomography	2	2
Portable ultrasonography	2	3
Other	No change	
Human power, person-year (person-year/daily patients)		
Doctors, staff	11.08 (0.097)	12.35 (0.099)
Doctors, residents	9.16 (0.080)	12.73 (0.102)
Nurses	52.69 (0.461)	52.14 (0.419)
Emergency medical technicians	9.85 (0.086)	9.96 (0.080)
Security	8.62 (0.075)	9.35 (0.075)

ICU = intensive care unit.
*All statistics from the government ED evaluation reports (the Ministry of Health and Welfare).

Main Outcomes

Table 3
Comparison of Outcomes Between Study and Control Phase

	Control (95% CI)	Study (95% CI)	Difference (95% CI)	p-value
ED visits, person/day, mean	114.3 (112.4 to 116.2)	124.5 (122.8 to 126.3)	−10.2 (−12.8 to −7.6)	<0.001
To emergency ward, %*	5.7 (5.3 to 6.0)	7.9 (7.6 to 8.2)	−2.2 (−2.7 to −1.8)	<0.001
To inpatient wards, %*	19.4 (18.6 to 20.2)	17.7 (17.1 to 18.3)	1.7 (0.7 to 2.8)	<0.001
To other hospitals, %*	3.5 (3.3 to 3.7)	2.5 (2.3 to 2.7)	1.0 (0.8 to 1.3)	<0.001
To be discharged, %*	71.4 (70.6 to 72.2)	71.9 (71.3 to 72.6)	−0.5 (−1.5 to 0.5)	0.32
Mortality rate, %*				
After CPR	0.76 (0.63 to 0.88)	0.73 (0.64 to 0.81)	−0.03 (−0.18 to 0.12)	0.69
In ED	0.80 (0.71 to 0.89)	0.71 (0.63 to 0.79)	−0.09 (−0.21 to 0.03)	0.15
Total	1.96 (1.83 to 2.09)	2.12 (2.00 to 2.25)	0.16 (−0.03 to 0.35)	0.10
Admission to emergency ward				
Persons/day, mean	6.2 (5.9 to 6.4)	9.6 (9.3 to 10.0)	3.4 (3.1 to 3.9)	<0.001
Disposition from emergency ward				
To inpatient ward, %†	44.8 (41.3 to 48.4)	42.6 (39.6 to 45.6)	−2.2 (−6.8 to 2.4)	0.35
To other hospitals, %†	2.9 (2.2 to 3.8)	8.2 (7.2 to 9.3)	5.6 (3.9 to 6.6)	<0.001
LOS, mean				
ED overall, hours	15.1 (14.8 to 15.3)	13.4 (13.2 to 13.6)	−1.6 (−1.9 to −1.3)	<0.001
Discharged from ED, hours	9.3 (9.1 to 9.5)	7.7 (7.6 to 7.9)	−1.6 (−1.8 to −1.3)	<0.001
Admitted from ED, hours	32.3 (31.7 to 32.9)	30.0 (29.6 to 30.5)	−2.3 (−3.0 to −1.5)	<0.001
Emergency ward, days	4.5 (4.4 to 4.6)	3.1 (3.0 to 3.2)	−1.4 (−1.6 to −1.3)	<0.001

*Denominator = all patients who visited the ED.
†Denominator = all patients admitted to the emergency ward.
CPR = cardiopulmonary resuscitation; LOS = length of stay.

DISCUSSION

- How to use community level resources more safely(EMT)
- Use their resources more efficiently

LIMITATIONS

- LOS as the primary outcome(a key throughput factor)
- Few data on the outcome of transferred patients
- No information on patient satisfaction
- 1/5 of patients refused to be transferred

CONCLUSION

- ICP significant reduction in ED LOS without increasing the usage of inpatient beds or increasing hospital mortality
- Other Countries?

Diagnostic and prognostic utility of troponin estimation in patients presenting with syncope: a prospective cohort study

Matthew J Reed, David E Newby, Andrew J Coull, et al.
Emerg Med J 2010 27: 272-276
doi: 10.1136/emj.2008.068635

INTRODUCTION AND AIMS

- All cases of syncope→ 10% cardiac causes (< 2% by AMI)
- 1971 WHO diagnosis of AMI:
  1. typical history
  2. characteristic ECG changes
  3. raised cardiac enzymes
- 2007, Troponin was added

- Troponin in ER in order to rule out AMI
- If NO chest pain?
- Risk stratification of patients with syncope
- Cardiac syncope →1-year mortality between 10~30%
- Troponin VS serious outcome or all-cause death after syncope

METHODOLOGY

- Age≧16
- Syncope: a transient LOC with an inability to maintain postural tone followed by spontaneous recovery without any intervention
- Exclude:
  excessive alcohol consumption
  had a good history of seizure
  a prolonged (>15 min) postictal phase

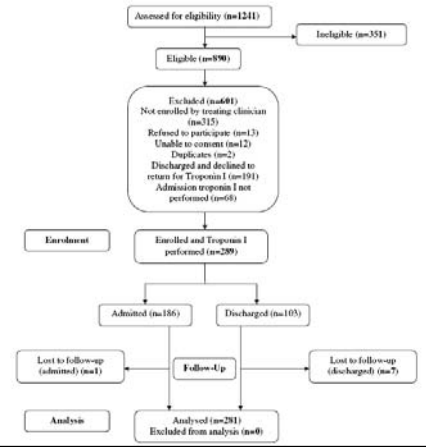
TROPONIN MEASUREMENT

- 12 h after admission with syncope
- Discharged Patient: 12hr~7days
  (Troponin HL: 24Hrs, 12hr~7days if myocardial necrosis)

ENDPOINT MEASURES

- admission AMI
- the combination of serious outcome (excluding admission AMI)
- all-cause death
- both at 1 month after ED presentation

- (1) AMI
- (2) life-threatening arrhythmia
- (3) insertion of a pacemaker, or insertion of an internal cardiac defibrillator device
- (4) pulmonary embolus
- (5)CVA, ICH or SAH
- (6) haemorrhage requiring BT
- (7) acute surgical procedure



RESULT

Table 2 Contingency table of serious outcome (excluding acute myocardial infarction) and all-cause death and troponin I value (n=281)

	Serious outcome (excluding admission acute myocardial infarction) or all-cause death?		
	Yes	No	Total
Troponin I≥0.2?			
Yes	7	7	14
No	16	251	267
Total	23	258	281*

Fisher exact test p<0.0001. Sensitivity=30% (95% CI 14 to 53). Specificity=97% (95% CI 94 to 98). PPV=50% (95% CI 24 to 76). NPV=94% (95% CI 90 to 96). Positive likelihood ratio=11.2 (95% CI 4.3 to 29.2).
*Eight patients lost to follow-up; therefore, n=281 rather than 289.

DISCUSSION

- AMI is an infrequent (1.4%) cause
- Troponin I provides little additional benefit in AMI-caused
- Negative troponin may →safely discharged early after admission
- No symptoms, ECG change → AMI-caused extremely low
- Troponin in no role in r/o AMI

STUDY LIMITATIONS

- Measure in all patients in order to get full case ascertainment and a more robust prediction of risk
- **Incorporation bias**(may exclude AMI)

CONCLUSIONS

- NOT use to r/o AMI-caused
- Troponin I may predict 1-month serious outcome or all-cause death in patients presenting with syncope to the ED.