

## What will be the percentage drop in attendance of Accident & Emergency department after implementation of charges?

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The attendance of Accident & Emergency (A&E) departments in Hong Kong increased from 1.1 million in 1990 to 2.3 million in 2000. The statistics of Hospital Authority showed that about 75% of the attendance belonged to the semi-urgent or non-urgent cases. It is expected that the A&E attendance will drop after implementation of A&E charges. A cross-sectional study was done using the database of a typical medium size A&E department in Hong Kong to analyse this impact. The result of statistical analysis showed that there would be about 30% drop in A&E attendance. Other factors, however could affect the results and these were discussed. After adjustment, it was concluded that there would be about 20% drop in attendance after the implementation of A&E charges. (*Hong Kong j.emerg.med.* 2001;8:241-246)

**Keywords:** A&E charges, A&E department, computer, diagnosis coding, triage

### Introduction

The attendance of Accident & Emergency (A&E) departments in Hong Kong increased from 1.1 million in 1990 to 2.3 million in 2000. The statistics<sup>1</sup> of Hospital Authority (HA) showed that about 75% of the attendance were of the semi-urgent or non-urgent patients whereas the remaining 25% was urgent or emergency cases. The high percentage of workload of semi-urgent or non-urgent cases may affect our primary function of treating emergency patients. Currently patients using A&E services do not have to pay. Therefore, A&E charges is proposed in order to modify patients' behaviour. The attendance and proportion of semi-urgent and non-urgent cases of A&E department (AED) are expected to change after implementation of charges. The attendance pattern of AEDs in Hospital Authority in year 2000 was shown in Table 1.

The AED of Alice Ho Miu Ling Nethersole Hospital (AHNH) was a typical medium size AED in Hong Kong. It is a 500 beds acute hospital with 24 hours emergency services. The annual AED first attendance was 138,583 in year 2000. The ratio of trauma to non-trauma cases was 17% and 73% respectively. Eleven percent of the patients arrived by ambulance. The proportion of different triage categories was similar to other medium size AEDs in Hong Kong. (Table 2) A cross-sectional study was done to predict the impact of A&E charges on A&E attendance.

### Methodology

The study design was a cross-sectional study with data obtained from the computer systems in Hospital Authority. The two computer systems included the Accident and Emergency Information System version 2.0,<sup>2</sup> Clinical Management System-A&E version 2.03<sup>3</sup> and Executive Information System version 4.0.0.<sup>4</sup> These data were downloaded and processed by computer program Microsoft Excel 2000.<sup>5</sup> The triage categories were based on the standard A&E Triage Guidelines published by Hospital Authority. (Appendix 1) The diagnosis coding used was the

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International Classification of Disease version 9.0.<sup>6</sup> Since the coding behaviour of doctors varied, a computer program written by author using Microsoft Visual FoxPro 6.0<sup>7</sup> was used to group the diagnosis codes into common disease categories. Appendix 2 illustrates examples of disease codes in different disease groups.

It is assumed that patients who will seek alternative sources of medical service will be those in semi-urgent or non-urgent disease groups. The study population would be all first attendance to AHNH AED in year 2000. The inclusion criteria are as follows:

1. Attendance between 09:00 hours to 21:00 hours as some services could be provided by general practitioners in this period; and
2. All triage category 4 (semi-urgent) and 5 (non-urgent) cases.

Patients of some disease groups are expected to seek A&E services even though they belong to triage category 4 or 5. Therefore, the exclusion criteria would include trauma cases and some special disease groups such as chest pain. The computer database in year

**Table 1.** Attendance and morbidity pattern of AEDs in Hospital Authority in year 2000.

	Triage 1	Triage 2	Triage 3	Triage 4	Triage 5	Triage unclassified	Total
A&E 1st attendance: traumatic	2,524	4,080	64,131	321,203	30,193	1,316	423,447
A&E 1st attendance: non-traumatic	11,951	36,359	424,916	1,019,458	350,998	34,046	1,877,728
Total 1st A&E attendance	14,475	40,439	489,047	1,340,662	381,191	49,382	2,315,196
A&E attendances brought in by ambulance	10,985	20,296	146,913	129,077	5,187	4,329	316,787

**Table 2.** Comparison of triage categories of AEDs in Hong Kong with similar annual attendance in year 2000.

1st attendance	AHNH	CMC	NDH	PMH	QMH	TSKH	YCH	Total
Triage 1	482	970	594	631	1144	460	935	5216
Triage 2	5314	1732	944	1472	3635	1691	1873	16661
Triage 3	26957	18595	22805	36041	35894	13974	32983	187249
Triage 4	94186	68818	77986	71767	80611	68304	88959	550631
Triage 5	11368	37737	19846	26021	17584	18728	21259	152543
Triage U	276	130	5000	2704	1073	2634	3999	15816
<b>Total</b>	<b>138583</b>	<b>127982</b>	<b>127175</b>	<b>138636</b>	<b>139941</b>	<b>105791</b>	<b>150008</b>	<b>928116</b>
Triage 1-3	32753	21297	24343	38144	40673	16125	35791	209126
percentage	23.63%	16.64%	19.14%	27.51%	29.06%	15.24%	23.86%	22.53%
Triage 4-5	105554	106555	97832	97788	98195	87032	110218	703174
percentage	76.17%	83.26%	76.93%	70.54%	70.17%	82.27%	73.47%	75.76%

AHNH : Alice Ho Miu Ling Nethersole Hospital  
 CMC : Caritas Medical Center  
 NDH : North District Hospital  
 PMH : Princess Margaret Hospital  
 QMH : Queen Mary Hospital  
 TSKH : Tang Siu Kin Hospital  
 YCH : Yan Chai Hospital  
 Triage : Triage category 1-5, Triage U=unclassified

2000 was run using computer software Microsoft Visual Foxpro 6.0. with the inclusion and exclusion criteria as filters.

## Result

The total number of first attendance in our AED was 138,583 in year 2000. The study population would be adjusted according to the inclusion and exclusion criteria. The AHNH A&E attendance between 09:00 to 21:00 hours was 85,366, representing 61.59% of total A&E attendance. If only the triage category 4 or 5 were included, the study population would be reduced to 73,767, representing 53.23% of total A&E attendance. If trauma cases were also excluded, the study population would be further reduced to 59,200, representing 42.72% of total A&E attendance. (Table 3) The male and female distribution was 46% and 54% respectively. The age group for 0-15, 16-65 and >65 were 25%, 61% and 14% respectively.

Certain symptoms are very frightening to patients, for example, chest pain. These patients will attend AED for advice. If these "frightening disease groups" were also excluded, the study population would be further reduced to 46,399, representing 33.48% of total A&E attendance. The remaining disease groups were shown in Table 4.

## Discussion

After the introduction of A&E charges, we expect patients of certain disease groups to seek alternative sources of medical services. The affected patients will be the non-traumatic group of triage category 4 or 5 cases between 09:00 to 21:00 hours. If we assume that these patients will be turned away, there will be

33.48% drop of A&E attendance in our hospital. However, other factors should be taken into considerations such as those whose A&E charges are waived, economic status of Hong Kong, perception of diseases by the general public and the insurance policy. Nevertheless, the following patient groups are expected to continue to use A&E services:

1. Patients receiving Comprehensive Social Security Scheme (CSSA), their A&E charges are waived.
2. Patients who are willing to pay.
3. Patients who are unwilling to pay but continue to use A&E services. (resulting in bad debts)
4. Patient groups whose charges are waived e.g. Government servants, staff of HA.
5. Patients under legal custody.
6. New patient group who are willing to pay for better services, but may be more demanding.

The exact percentage of effect of the above factors was unknown. As majority of "in-patient" are from AED, the payment status of "in-patient" would be a good predictor of payment status in A&E population. According to the statistics of payment status of "in-patient" in AHNH in year 2000, only 67% of payment was received. The remaining 27% was waived, 5% was outstanding and 1% was bad debt, giving a total of 33%. (Table 5) This implies that probably 33% of A&E population who will continue to use A&E services as without payment (waived). If this percentage was applied to our study population, 11.05% would be deducted from the 33.48% and the adjusted figure for initial drop in A&E attendance would be 22.43%.

**Table 3.** Percentage drop of A&E attendance after filtered by inclusion and exclusion criteria.

Criteria	Attendance number	Percentage of total
Total attendance in 2000	138,583	100%
Attendance between 09:00 - 21:00 hours	85,366	61.59%
Limited to triage category 4 or 5 cases	73,767	53.23%
Limited to non-traumatic cases	59,200	42.72%

**Table 4.** Disease groups that can be treated by alternative medical services.

Diagnosis	Number	Percentage	Cum_%
UPPER RESP. TRACT INFECTION	18397	13.28%	13.28%
ABDOMINAL PAIN	4960	3.58%	16.85%
DIARRHOEA	4556	3.29%	20.14%
MINOR EYE PROBLEMS	2752	1.99%	22.13%
DIZZINESS	1978	1.43%	23.55%
SKIN DISORDER	1940	1.40%	24.95%
JOINT PAIN	1915	1.38%	26.34%
ALLERGY	1394	1.01%	27.34%
MINOR ENT PROBLEMS	1359	0.98%	28.32%
BACK PAIN	1337	0.96%	29.29%
HEADACHE	898	0.65%	29.94%
ORTHOPAEDIC PROBLEMS	793	0.57%	30.51%
DENTAL PROBLEMS	461	0.33%	30.84%
VOMITING	424	0.31%	31.15%
ANAL DISEASE	341	0.25%	31.39%
UROLOGY	337	0.24%	31.64%
NORMAL FINDING	305	0.22%	31.86%
GENITAL PROBLEM	302	0.22%	32.07%
BODY SWELLING	294	0.21%	32.29%
INFECTIOUS DISEASES	293	0.21%	32.50%
HYPERTENSION	200	0.14%	32.64%
FEVER	183	0.13%	32.77%
MISCILLANEOUS	164	0.12%	32.89%
DIABETES MELLITUS	134	0.10%	32.99%
BREAST PROBLEM	123	0.09%	33.08%
LYMPH NODE	95	0.07%	33.15%
STONE	94	0.07%	33.21%
CANCER	93	0.07%	33.28%
HERNIA	81	0.06%	33.34%
VASCULAR DISEASE	67	0.05%	33.39%
THYROID	62	0.04%	33.43%
HEPATOBIILIARY DISEASE	57	0.04%	33.47%
SYSTEMIC LUPUS ERYTHROMATOSIS	10	0.01%	33.48%
TOTAL	46399		33.48%

**Table 5.** Payment of hospital fee by in-patient and out-patient in AHNH in year 2000.

	In-patient	Out-patient
Payment received	67%	82%
Waived (CSSA/MSW etc.)	27%	18%
Outstanding	5%	--
Bad debt	1%	--
Total	100%	100%

According to the statistics in Hospital Authority, the percentage of A&E attendance by ambulance was 14%, of which 42.39% belongs to category 4 and 5. (Table 6)

This implies that a high percentage of people in Hong Kong perceive their illness as urgent even though they are triaged as category 4 or 5 by medical staff. Moreover, the attendance of AED may increase after the adaptation period and an example of this is the

**Table 6.** A&E first attendance by ambulance in year 2000.

	<b>Triage 1</b>	<b>Triage 2</b>	<b>Triage 3</b>	<b>Triage 4</b>	<b>Triage 5</b>	<b>Unclassified</b>	<b>Total</b>
Number	10,985	20,296	146,913	129,077	5,187	4,329	316,787
Percentage	3.47%	6.40%	46.38%	40.75%	1.64%	1.37%	100%

response to the increase of cross-harbour tunnel fees. In summary, the objective figure shows that there will be initial drop of A&E attendance of about 30% after the implementation of A&E charges. However, after adjustment it is expected to be around 20%. If we applied this percentage to the all A&E departments in Hong Kong, there will be an initial drop of 400,000 to 500,000 annual A&E attendance. As our department is a typical medium size AED serving about 250,000 to 300,000 populations in Hong Kong, we expect similar percentage drop in other medium size AEDs. However, there is difference between large and medium size hospitals as large hospitals may provide specialised services such as neurosurgery consultations. This cross-sectional study tries to answer the question of "what will be the percentage drop in attendance of accident & emergency department after implementation of charges" from statistical points of view with the help of information technology. We try to be objective when deriving the result, however, there are many factors which can influence the results. Further studies such as an opinion survey are required to have a more accurate prediction.

## Acknowledgement

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## References

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3. Chan JTS. The first A&E clinical management system in Hong Kong. *Hong Kong J Emerg Med* 1998;5(2):124-8.
4. Executive Information System (EIS), information system in Hospital Authority.
5. Microsoft Excel 2000 is a computer product by Microsoft Corporation.
6. International Classification of Disease version 9 with clinical modification: ICD9cm.
7. Microsoft Visual Foxpro 6.0 is a computer product by Microsoft Corporation.

## Appendix 1. Hospital Authority Triage guideline for A&E

<b>Triage category</b>	<b>Terminology</b>	<b>Vital sign</b>	<b>Description</b>
1	Critical	Unstable	Patient have life threatening condition caused by major event or with unstable vital signs requiring immediate resuscitation.
2	Emergency	Borderline	Patient is suffering from a potentially life threatening condition with borderline vital signs and requires emergency treatment and close immediate continuous monitoring.
3	Urgent	Stable	Patient is suffering from a major condition with relatively stable vital signs and requires treatment as early as possible.
4	Semi-urgent	Stable	Patient is suffering from an acute but stable condition with stable vital sign which can afford to wait for some time without serious complications.
5	Non-urgent	Stable	Patient is suffering from a minor and stable condition. The condition can afford to wait without deterioration and can be treated in primary care facilities. Patient will be attended more appropriately through utilization of medical resources other than the A&E service.

Appendix 2. Example of grouping ICD9-cm codes into different disease groups.

Diagnosis group	Diagnosis codes	ICD9-cm code
UPPER RESPIRATORY TRACT INFECTION	- Upper Respiratory Tract Infection	465.0-465.9
ABDOMINAL PAIN	<b>Including Gastro-intestinal System but Excluding GE</b> - Non-specific Abdominal Pain - Gastritis/Duodenitis - Constipation - Appendicitis - Intestinal Obstruction - Peritonitis - Perforated Peptic Ulcer	789.00-789.09 535.00-535.60 564.0 540.0-540.9 560.0-560.9 567.0-567.9 531.10-533.10
GASTROENTERITIS	<b>Including Diarrhoea</b> - Gastroenteritis - Dysentery - Food Poisoning	558.9 003.0-004.9 005.0-005.9
DIZZINESS	<b>Exclude Trauma, Poisoning, Convulsion, Hypoglycaemia</b> - Dizziness - Syncope - Vertigo - Confusion - LOC - Vestibular Neuronitis - Meneire's Disease	780.4 780.2 386.10,386.11,386.19 298.9 780.09 386.12-386.9 386.00-386.04
JOINT PAIN	<b>Excluding Trauma, Back Pain</b> - Non-specific Joint Pain - Gouty arthritis - Osteoarthritis - Rheumatoid Arthritis - Pyogenic Arthritis	719.40-719.49 274.0-274.9 715.00-715.98 714.0-714.33 711.00-711.09
HEAD INJURY	<b>Exclude Facial Injury</b> -Head Injury	854.00-854.19
SHORTNESS OF BREATH	<b>Shortness of Breath</b> - Asthma - COAD/Cor Pulm - Heart Failure - Pleural Effusion - Renal Failure - Hyperventilation - Pneumothorax - Resp Abnormalities - Acute Pulmonary Oedma - Pneumoconiosis - Respiratory Arrest - Pulmonary Embolism	493.00-493.91 496.415.0 428.0-428.9 511.1-511.9 584.5-584.9 786.01 512.0-512.8 786.00 428.1 505 799.1 415.1
CHEST PAIN	<b>Excluding Trauma</b> - Non-specific chest pain - Costochondritis - Angina - Unstable Angina - Acute Myocardial Infarction - Pleurisy - Esophagitis	786.50-786.59 733.6 413.0-413.9 411.1 410.11-410.91 511.0 530.10-530.19
CONTUSION	<b>No Wound</b> Contusion	924.00-924.9
EYE PROBLEMS	<b>Including Trauma</b> - Conjunctivitis - Others - Eye Injury - Styes - Conjunctival Haemorrhage - Visual Loss - Cataract - Glaucoma	372.00 - 921.0-921.9 373.11-373.13 372.72 369.00-369.9 366.00-366.9 365.00-365.9