A retrospective study of geriatric patients presenting with fever to an accident and emergency department in Hong Kong

因發燒到香港一所急症室求診的老年病人的追溯性研究

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Objectives: To study the characteristics and outcome of geriatric patients presenting with fever to an emergency department in Hong Kong and to analyse the factors affecting their length of stay. *Methods:* Retrospective study. Patients aged ≥65 who complained of fever, or with temperature ≥37.5°C (aural) presenting to the Accident and Emergency Department (AED) of Caritas Medical Centre in Hong Kong from 14 November 2006 to 13 December 2006 were enrolled. The demographic data, clinical information and outcomes were studied. The characteristics of short stay and long stay patients were compared. *Results:* There were 370 patients in the study. Their median age was 80. Of these patients, 64.9% were category 3 or above, i.e. urgent, emergent or critical. The most common chief complaints were fever, shortness of breath, dizziness and cough. The admission rate was 81.9%. The median length of stay in hospital was 4.3 days. The most common hospital discharge diagnoses were chest infection, urinary tract infection, and fever with unknown cause. The discharge rate within 48 hours was 24.6%. With further analysis, temperature, walking ability, triage category and neutrophil count were significantly different between short stay (≤48 h) and long stay (>48 h) patients. For those discharged alive either from the AED or ward, 20.1% re-attended the AED within 14 days of discharge, and 17.5% of those previously discharged were admitted again for fever or other problems. *Conclusion:* Elders with fever are a major challenge to the AED and health care facilities. The admission rate for this group of patients is usually high. Elders with poor walking ability, high triage category, high temperature and neutrophil count were prone to have longer stay. (*Hong Kong j.emerg. med.* 2008;15:88-95)

目的：研究因發燒到香港一所急症室求診的老年病人的特色及結果，及分析影響住院期的因素。**方法：**追溯性研究。登記於2006年11月14日至2006年12月13日期間到香港明愛醫院急症室求診，申訴發燒或耳探溫度37.5°C或以上而年齡在65歲或以上的病者。研究人口統計數據，臨床資料及結果，並比較短住院期及長住院期病者的特色。**結果：**研究共有370名病人。年齡中位數為80歲，當中64.9%為分流類別3或以上，即是緊急、危急或危殆。最普遍的主訴為發燒、氣促、暈眩及咳嗽。入院率為81.9%。住院期中位數為4.3天。最普遍的出院診斷為胸部感染、泌尿道感染，及不明原因的發燒。48小時內出院率為24.6%。在進一步分析下，短住院期（≤48小時）及長住院期（>48小時）的病人在體溫、行動能力、分流類別及嗜中性白血球計數有顯著的差別。由急症室或病房生存出院的病人，20.1%出院後14天內再到急症室求診，先前出院的17.5%病人因發燒或其他問題再次入院。**總結：**有發燒的長者是急症室及醫療設施的一個重大挑戰。這類病人的入院率通常很高。行動能力差、高的分流類別，發高燒及高嗜中性白血球計數的長者的住院期傾向較長。

Keywords: Admission, aged, emergency medicine, hospitalisation, length of stay

關鍵詞：入院、年老、急症醫學、住院、停留期間

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Introduction

The geriatric population is growing in Hong Kong. The elders (age ≥65) comprised 12.6% of the total population of 6,925,900 in 2007 compared with 10.1% of the total 6,217,556 in 1996.[1] In Sham Shui Po, the local district where our department serves, the regional geriatric population ≥65 has reached 16.7% which is among the highest in Hong Kong.[2] The accident and emergency department (AED) visit and hospital admission among the elders have become more frequent. Geriatric patients comprise 27.3% of all attendances in our emergency department. This raises the need to improve our knowledge on geriatric emergency so as to provide better and effective care to our senior citizens.

There are many challenges in managing geriatric emergencies. In this study, we focused on fever, which was a very common chief complaint among the elders presenting to our AED. By understanding the characteristics of the elders presenting with fever, it would facilitate us to formulate the management plan for these patients in emergency settings.

The characteristics of short stay patients were studied as we aimed to spot out any factor that might affect the length of stay of these patients. Hopefully, these might help us to select patients for admission into the emergency medicine ward.

Methods

This study was carried out in the Accident and Emergency Department of Caritas Medical Centre, a general public hospital in the urban area of Hong Kong.

We retrospectively studied patients attending our department from 14th November 2006 to 13th December 2006. By searching the consultation charts of a total of 10,774 patients during this one month study period, all elders (age ≥65) who complained of fever, or with a temperature ≥37.5°C (ear temperature) would be enrolled. We recorded the demographic data (age, gender, residence), walking ability, triage category, community geriatric assessment team (CGAT) support, clinical information (presenting symptoms, diagnosis, chest X-ray findings, initial white cell count, neutrophil count, blood culture result, creatinine level, history of hypertension, diabetes mellitus (DM), ischaemic heart disease (IHD), cerebrovascular accident (CVA) and chronic obstructive pulmonary disease (COPD), AED diagnosis and outcome (admission rate, length of stay, mortality, hospital diagnosis, AED re-attendance and hospital re-admission). All information was obtained from the AED consultation charts or from electronic records in the Hospital Authority intranet. Data were entered and analysed with the SPSS version 14.0 (SPSS Inc., Chicago, IL).

We further studied the characteristics of short stay patients. We divided the patients into two groups according to their length of stay. Group 1 included patients who were discharged within 48 hours either from the AED or ward. Patients who died within 48 hours were excluded from the analysis. Group 2 included patients who stayed in hospital >48 hours. By using the chi–square test and t-test, we looked for significant difference between these two groups. Logistic regression (forward stepwise method) was performed for the significant factors identified. A p value <0.05 was regarded as statistically significant.

Results

A total of 10,774 patients attended our department within the study period, 27.3% (2942/10,774) patients were ≥65 years old and 370 patients were enrolled into the study, comprising 12.6% (370/2,942) of all geriatric patients presenting during this period. Table 1 shows the results of all demographic data, clinical information and investigations.

Their age ranged from 65 to 106 with median of 80, 64.9% of these patients were category 3 or above, i.e. urgent, emergent or critical and 46.5% patients lived in nursing homes. Among them, about 70% had CGAT support. Most of the elderly in nursing homes were chair or bed bound. The most common chief complaints were fever, shortness of breath, dizziness and cough.

Table 1. Demographic data, clinical information and investigation

	Number	Percentage
Age (mean)	80.36	
Gender		
Male	186	50.3%
Female	184	49.7%
Residence		
Home	198	53.5%
Nursing home without CGAT	51	13.8%
Nursing home with CGAT	121	32.7%
Walking ability		
Walk +/- aids	236	63.8%
Chair/bed bound	134	36.2%
Triage category		
1. Critical	4	1.1%
2. Emergency	21	5.7%
3. Urgent	215	58.1%
4. Semi-urgent	128	34.6%
5. Non-urgent	2	0.5%
Tympanic temperature [^{o}C]	38.1 (SD 0.8) Range 36.0-40.7	
Systolic blood pressure [mmHg]	153 (SD 26.9) Range 81-250	
Diastolic blood pressure [mmHg]	76 (SD 16.2) Range 40-135	
Pulse [/min]	99 (SD 19.7) Range 50-183	
Chief complaints		
Fever	159	43.0%
Shortness of breath	56	15.1%
Dizziness	23	6.2%
Cough	19	5.1%
Musculoskeletal pain	15	4.0%
Abdominal pain	13	3.5%
Diarrhoea	12	3.2%
Vomiting	10	2.7%
Chest X-ray		
Not done	82	22.2%
Normal	131	35.4%
Infiltrate/consolidation	154	41.6%
Antibiotics in emergency department		
No	365	98.6%
Yes	5	1.4%
Observation ward stay		
No	337	91.1%
Yes	33	8.9%
Blood culture		
Not done	172	46.5%
Negative	161	43.5%
Positive	37	10.0%
Initial white cell count (n=325) [x 10^{9}/L]	12.6 (SD 5.4) Range: 0.8-39.9	
Neutrophil count (n=295) [x 10^{9}/L]	10.6 (SD 5.4) Range: 0.1-36.1	
Creatinine level (n=325)	115.7 (SD 68.2) Range: 30-580	

CGAT=community geriatric assessment team

The observation ward stay was 8.9%. The incidence of co-morbidities of the elders was high. More than half of the patients had hypertension. About ¼ of them had diabetes mellitus and/or cerebrovascular accident (Table 2). The most common AED diagnoses were chest infection, fever and sepsis (Table 3).

The admission rate was 81.9%. Among the admitted patients, 93.3% were admitted to medical wards, and 4.1% and 2.6% were admitted to surgical and orthopaedic wards respectively (Table 4).

The most common hospital diagnoses were chest infection, urinary tract infection, and fever with unknown cause (Table 5).

The length of stay of those discharged from AED or ward ranged from 0.01 to 45 days with a median length of stay in hospital of 4.30 days. The mean was 7.14 days (Table 6).

The discharge rate within 48 hours was 24.6%, and 9.2% of those admitted to hospital died. For those discharged alive either from the AED or ward, 20.1% re-attended the AED within 14 days of discharge, and 17.5% of those previously discharged were admitted again for fever or other problems (Table 6).

Short stay patient analysis

We divided all the patients into two groups according to their length of stay. The length of stay was counted from the registration time at the AED to the discharge time from either the AED or the ward. Group 1 (total 91 patients) included patients who were discharged within 48 hours either from the AED or ward with exclusion of those patients who died within 48 hours.

Table 2. Co-morbidities

	Number	Percentage
Hypertension	189	51.1%
Cerebrovascular disease	95	25.7%
Diabetes mellitus	85	23.0%
Ischaemia heart disease	69	18.6%
Chronic obstructive pulmonary disease	64	17.3%

Table 3. Emergency department diagnosis

	Number	Percentage
Chest infection	83	22.4%
Fever	77	20.8%
Sepsis	26	7.0%
Upper respiratory infection	24	6.5%
Chronic obstructive pulmonary disease	22	5.9%
Gastroenteritis	17	4.6%
Musculoskeletal problem	14	3.8%
Decreased general condition	10	2.7%
Urinary tract infection	7	1.9%
Abdominal pain	6	1.6%
Congestive heart failure	6	1.6%
Gastrointestinal bleeding	5	1.4%
Gout	5	1.4%
Dizziness	4	1.1%
Cholangitis	3	0.8%

Table 4. Emergency department disposal

	Number	Percentage
Admitted	303	81.9%
Medical ward	283 (93.4%)	
Surgical ward	12 (4.0%)	
Orthopaedic ward	8 (2.6%)	
Home	56	15.1%
Home with follow up appointment	8	2.2%
Home and referral to out-patient clinic	2	0.5%
Discharge against medical advice	1	0.3%
Death	0	0%

Table 5. Hospital principal diagnosis

Hospital diagnosis	Percentage
Pneumonia/chest infection	26.0%
Urinary tract infection	11.5%
Fever	10.2%
Chronic obstructive pulmonary disease	5.7%
Sepsis	4.4%
Malignancy	3.7%
Urinary infection	3.4%
Gastroenteritis	3.0%
Gout	2.0%
Cellulitis	1.7%

Table 6. Overall length of stay

Outcome	Number	Percentage
Length of stay		
Median	4.30 days	
Mean	7.14 days	
Range	0.01-45 days	
Discharge within 48 hours	91	24.6% (91/370)
Discharge >48 hours	272	73.5% (272/370)
Patients died in hospital	28*	9.2% (28/303)
2-week re-attendance at emergency department	69	20.2% (69/342)
		(total– deceased patients = 370-28 = 342)
Hospital 2-week re-admission	60	17.5% (60/342)

* 7 patients died within 48 hours

Group 2 (total 272) included patients who stayed more than 48 hours.

By comparison with the t-test, age, temperature, initial white cell count and neutrophil count showed significant difference between short stay and long stay patients (Table 7).

By comparison with the chi-square test, walking ability, history of cerebrovascular disease, triage category, emergency re-attendance, hospital re-admission, and chest X-ray findings had significant difference between the two groups. Other co-morbidities like hypertension, IHD, DM and COPD had no significant difference between the two groups.

Logistic regression (forward stepwise method) was then performed for all the above significant factors. The actual number of patients included in this analysis was 288 because some of the patients had not taken the blood tests and some clinical records had no information on walking ability or history of old CVA. It turned out that temperature, neutrophil count, triage category and walking ability were significant (Table 8).

Comparison of length of stay in different living environments

The mean length of stay of the patients living at home was 6.05 (SD 7.60) days, that of patients in hostel without CGAT was 10.47 (SD 8.94) days and that of patients in nursing home with CGAT was 7.95 (SD 8.43) days. When we studied the difference of length of stay in the living environments (home versus nursing home) and CGAT support , by using ANOVA (Table 9), there was significant difference between the elderly living at home and those living at nursing home without CGAT team support (p=0.002). However, while comparing the elders living in nursing homes, presence or absence of CGAT support had no significant difference.

Discussion

For those presenting with fever, there was a high admission rate of 81.9%. Among those admitted, 93.3% were admitted to medical wards, 4.1% and 2.6% were admitted to surgical or orthopaedic wards respectively. This was a huge burden to our hospital, especially to the Medicine & Geriatrics Department. It potentially affected the care of elderly patients. The subsequent AED re-attendance rate and hospital re-admission rate were up to 20.1% and 17.5% respectively.

The characteristics of the febrile elderly were as follows: -

1. >60% were urgent cases (triage category above 3)
2. >40% lived in nursing home
3. 36.2% of the patients were chair or bed bound
4. High incidence of co-morbidities

These signified our elderly patients were prone to more serous illnesses and required more transport support upon discharge.

Table 7. Comparison of short and long stay patients*

	Short stay (≤48 h) total: 91	Long stay (>48 h) total : 272	P value
Demographic data			
Age	77.18 (SD 8.28)	81.28 (SD 7.68)	<0.001
Living environment			<0.001
Home	68	129	
Nursing home without CGAT	7	43	
Nursing home with CGAT	16	100	
Walking ability			<0.001
Walk +/- aids	78	154	
Chair/bed bound	13	118	
Triage			
Triage category			<0.001
Urgent (category 3 or above)	25	209	
Non-urgent (category 4 or 5)	66	63	
Outcome			
ED re-attendance			0.011
Yes	22	47	
No	69	204	
Hospital re-admission			
Yes	16	44	0.011
No	75	207	
Co-morbidities			
History of old CVA			0.011
Yes	14	78	
No	77	194	
History of ischaemic heart disease			0.302
Yes	14	55	
No	77	217	
History of hypertension			0.649
Yes	45	142	
No	46	130	
History of diabetes mellitus			0.820
Yes	20	63	
No	71	209	
History of COPD			0.072
Yes	10	52	
No	81	220	
Clinical information and investigation results			
Temperature [^{o}C]	37.7 (SD 0.69)	38.3 (SD 0.83)	<0.001
Initial WCC [x 10^9/L]	10.22 (SD 3.37)	12.92 (SD 5.49)	<0.001
Neutrophil count [x 10^9/L]	7.74 (SD 3.13)	11.07 (SD 5.41)	<0.001
Chest X-ray			0.012
Infiltrate/consolidation	12	136	
Normal	23	108	
Blood culture			0.910
Positive	0	33	
Negative	13	148	

*7 patients who died within 48 hours were excluded.

CGAT=community geriatric assessment team; COPD=chronic obstructive pulmonary disease; CVA=cerebrovascular accident; ED=emergency department; WCC=white cell count

Table 8. Factors associated with longer hospital stay

	P	Odds ratio	95% CI for odds ratio Lower	Upper
Temperature	0.024	1.742	1.075	2.824
Neutrophil count	0.004	1.145	1.043	1.256
Triage category (non-urgent)*	0.000	0.247	0.120	0.505
Chair/bed bound	0.002	3.816	1.627	8.946

*non-urgent cases (OR 0.247) are less likely to be associated with longer stay

Table 9. Comparison of the length of stay in different living environments

Living environment	Length of stay, mean (SD)	Living environment comparison	P value
Home	6.05 (SD 7.60) days	Home vs Hostel with CGAT	0.134
Nursing home without CGAT	10.47 (SD 8.94) days	Home vs Hostel without CGAT	0.002
Nursing home with CGAT	7.95 (SD 8.43) days	Hostel with CGAT vs Hostel without CGAT	0.198

CGAT=community geriatric assessment team

Concerning the causes of fever

1. Chest infection was the most common cause.
2. Other common infectious causes included urinary tract infection, upper respiratory infection and gastroenteritis.
3. Musculoskeletal problems including cellulitis and gouty arthritis were also common and potentially manageable in the AED setting.

Short stay patients analysis

In order to stop the vicious cycle and provide more efficient care to this group of patients, we tried to analyse the characteristics of those patients discharged from the AED and ward within 48 hours. Hopefully, these would give us some hints to manage this group of patients in our emergency medicine ward. After the statistical comparisons, we found that walking ability, triage category, temperature and neutrophil count were significantly different between short and long stay patients.

For walking ability, 85.7% of short stay patients were able to walk with or without aids. However, only 56.6% of long stay patients were able to walk. Therefore, the walking ability (rather than advancing age) was an independently significant factor ($p<0.001$).

When patients arrive at the AED, they will first be assessed by an experienced and specially trained triage nurse, and priority will be given to urgent cases. Patients are divided into five categories according to their medical condition – category 1: critical; category 2: emergent; category 3: urgent; category 4: semi-urgent; and category 5: non-urgent.

We simplified these into two groups for statistical analysis. The first group was category 3 or above as urgent cases and the second group was category 4 and 5 as non-urgent cases. The results showed that 27.5% of short stay patients were urgent cases. On the other hand, 76.8% of long stay patients were urgent cases. ($p<0.001$)

For temperature of the patients, the mean of short stay patients was 37.7°C (ear temperature) and that of long stay patients was 38.3°C (ear temperature). So, the long stay patients usually had higher temperature ($p<0.001$).

For neutrophil count, the mean of short stay patients was 7.74×10^9/L and that of long stay patients was 11.07×10^9/L. These signified that long stay patients usually had higher neutrophil counts ($p<0.001$).

The results offered a preliminary concept on the predictive factors for length of stay. However, if we need to validate these factors or issue a cut off point for predictive parameters (e.g. temperature, neutrophil count), further studies will be required.

Limitations of the study

The retrospective nature of this study limited the clinical information from the medical chart. For example, the duration of fever and any preceding treatment might not be recorded in every medical chart.

The reliability of ear (tympanic) temperature detected by the infrared ear thermometer was not as good as that of oral temperature.[3-5] The temperature readings on the medical charts had not been double checked. The reason of using infrared ear thermometer was that since the SARS (severe acute respiratory syndrome) era in 2003, public hospitals in Hong Kong started to use this as the first line temperature measuring instrument for infection precaution. The infrared ear thermometer avoids mucocutaneous contact and has short measuring time. The ear pieces are also disposable.

The other inclusion criterion was a complaint of fever but with normal ear temperature. This helped to minimise patients lost as a result of inaccurate temperature measurement or taking antipyretic drug before attending the AED. Moreover, a temperature ≥37.5°C was chosen with reference to a study on the normal range of tympanic temperature of this age group[6] and studies on the elderly presenting with fever.[7,8]

Conclusion

Elders with fever are a major challenge to the AED and health care facilities. The admission rate for this group of patients is usually high. Elders with poor walking ability, high triage category, higher temperature and neutrophil count were prone to have longer stay.

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References

1. Census and Statistics Department, the Government of the Hong Kong Special Administrative Region. Hong Kong statistics: population and vital events. [cited 2008 Mar 27]. Available from: http://www.censtatd.gov.hk/hong_kong_statistics/statistical_tables/index.jsp?htmlTableID=002&excelID=&chartID=&tableID=002&ID=&subjectID=1
2. Census and Statistics Department, the Government of the Hong Kong Special Administrative Region. Hong Kong statistics: population and vital events - Summary statistics of district council districts in Kowloon, 2006. [cited 2008 Mar 27]. Available from: http://www.censtatd.gov.hk/hong_kong_statistics/statistical_tables/index.jsp?htmlTableID=002&excelID=&chartID=&tableID=002&ID=&subjectID=1
3. Prentice D, Moreland J. A comparison of infrared ear thermometry with electronic predictive thermometry in a geriatric setting. Geriatr Nurs 1999;20(6):314-7.
4. O'Brien DL, Rogers IR, Holden W, Jacobs I, Mellett S, Wall EJ, et al. The accuracy of oral predictive and infrared emission detection tympanic thermometers in an emergency department setting. Acad Emerg Med 2000;7(9):1061-4.
5. Baeyens H, De Dobbeleer G, Baeyens JP. [Validity of the tympanic infrared thermometer in geriatric inpatients]. [Dutch] Tijdschr Gerontol Geriatr 2001;32(5):206-9.
6. Chamberlain JM, Terndrup TE, Alexander DT, Silverstone FA, Wolf-Klein G, O'Donnell R, et al. Determination of normal ear temperature with an infrared emission detection thermometer. Ann Emerg Med 1995;25(1):15-20.
7. Wasserman M, Levinstein M, Keller E, Lee S, Yoshikawa TT. Utility of fever, white blood cells, and differential count in predicting bacterial infections in the elderly. J Am Geriatr Soc 1989;37(6):537-43.
8. Castle SC, Norman DC, Yeh M, Miller D, Yoshikawa TT. Fever response in elderly nursing home residents: are the older truly colder? J Am Geriatr Soc 1991;39(9):853-7.