

ACCIDENT & EMERGENCY DEPARTMENT DIAGNOSIS - HOW ACCURATE ARE WE?

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ABSTRACT

An audit of the accuracy of diagnoses for admitted patients made by the medical officers of the Accident and Emergency Department was carried out recently in Toa Payoh Hospital. This was done for a period of one week lasting from 2nd to 8th February, 1994. A total of 122 admissions were studied and their diagnoses at admission compared with the diagnoses at discharge made by the doctors from the various disciplines in the wards. It was found that a high degree of accuracy of diagnosis was achieved by the medical officers of the Accident and Emergency (A&E) Department for surgical disciplines (82.9% for General Surgery, and 95.8% for Orthopaedic Surgery), and an acceptable degree of accuracy (77.6%) for General Medicine. In addition, the usage of laboratory investigations in the Accident and Emergency Department was also studied. We also assessed the performances of trainees, senior and junior medical officers as well. It is hoped that such an audit will serve to define standards for diagnostic accuracy in the Accident and Emergency Department. This can be a useful tool in the future for measuring and improving the performance of individual Emergency Room medical officers, and also the various Accident and Emergency Departments.

Keywords: diagnostic accuracy, audit, Emergency room, admission diagnosis, performance indicator.

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INTRODUCTION

A common view we often hear from many doctors working in the various inpatient clinical departments in hospitals is that the Emergency Room diagnosis is either incomplete (ie broad symptomatic diagnosis) or inaccurate. There may be an element of truth in the belief. However, we feel that the majority of diagnoses made by the doctors in the Emergency department are accurate enough for the purpose of starting initial investigations and treatment.

In early February 1994, our Accident and Emergency (A&E) department audited the accuracy of the diagnoses made in patients admitted from the department to Toa Payoh Hospital. This was done as part of the hospital's ongoing programme of departmental medical audits to ensure quality medical care. It was hoped that an insight into this aspect of the Accident & Emergency Department's performance could be gained. With this 'yardstick', the performance of future medical officers working in the department could also be compared, either on a group basis or as individuals. In this way, medical officers who tend to make more inaccurate diagnoses than their peers could be identified and guidance provided by the more senior staff.

METHODS

From 2nd to 8th February 1994, all patients admitted to the departments of Medicine, Surgery and Orthopaedics in Toa Payoh Hospital from the Accident and Emergency department by the medical officers were audited. This period was chosen as it was the medical officers' fourth month in the posting, and these doctors were sufficiently orientated to work in the

department.

The medical officers were required to fill in a form (Appendix 1) listing their clinical diagnoses for each patient. Each medical officer was briefed individually on the study and how to fill in the form. They were encouraged to arrive at a definite diagnosis, avoiding broad symptom diagnoses as far as possible. There may have been more than one diagnoses for each patient; all were included for assessment.

The diagnosis of each patient was then compared with the diagnosis made by the ward doctors at discharge. This was made easier by the use of the three-digit International Classification of Diseases (ICD)-9 Coding System.

Determination of accuracy

A diagnosis made by an emergency room doctor was judged to be accurate if both the ICD codings at admission and discharge were the same. For those ICD codings which failed to match, a further analysis was made on a case to case basis.

In the second analysis, an emergency room diagnosis was considered accurate if it was sufficiently similar in clinical presentation, physiology, or pathology, to the discharge diagnosis, as often elucidation of the final diagnosis would have been beyond the capability of investigative facilities available to the Emergency Room. This is exemplified by the cases in Table I.

Any diagnoses that failed to fulfil the above criteria were deemed to be inaccurate. Such diagnoses include those that were symptom based (eg syncope for investigation, prolonged fever for investigation, abdominal pain for investigation).

There remained some emergency room diagnoses (eleven in all) which were not pursued by the inpatient department doctors. As such, their accuracy could not be determined.

Usage of investigations in the A&E department

Medical officers were also asked to list the investigations done for each patient. The usage of laboratory investigations by the emergency room officers was then assessed. Each case was audited by the senior staff of the A&E department, and based on the A&E notes, the investigations were then deemed appropriate or inappropriate. This was determined by the clinical indications from the history-taking and physical examination which the senior staff obtained from the A&E

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Table II – Distribution of admissions by discipline

Discipline	Number of admissions	Percentage of admissions
General Medicine	73	59.8%
General Surgery	26	21.3%
Orthopaedic Surgery	23	18.9%

1) Correctness of admissions by disciplines

Based on the final discharge diagnosis, each patient was reviewed to see if he or she had been admitted to the correct discipline. The results are shown in Table III.

The wrong admission for General Surgery was a case of suspected perforated gastric ulcer which turned out to be bronchopneumonia.

The wrong admissions for General Medicine were:

- a) a case of suspected ascites which turned out to be a large ovarian cyst,
- b) a case of syncope which turned out to be a head injury.

In the latter case, no history or eyewitness account were obtainable. There was difficulty in determining whether the syncope resulted in any head injury as no obvious head injury was found by the emergency room doctor.

Table III – Ward admissions by disciplines

Discipline	No. of correct admissions	No. of incorrect admissions	Total No. of admissions
General Medicine	71 (97.3%)	2 (2.7%)	73 (100%)
General Surgery	25 (96.2%)	1 (3.8%)	26 (100%)
Orthopaedic Surgery	23 (100%)	0 (0%)	23 (100%)

Table IV – Accuracy of Emergency Room diagnoses for the various disciplines

Discipline	No. of diagnoses by A&E Dept			
	Accurate	Inaccurate	Not classified	Total
General Medicine	83 (77.6%)	16 (15.0%)	8 (7.4%)	107 (100%)
General Surgery	29 (82.9%)	4 (11.4%)	2 (5.7%)	35 (100%)
Orthopaedic Surgery	23 (95.8%)	0 (0%)	1 (4.2%)	24 (100%)
Total	135	20	11	166

2) Accuracy of Emergency Room diagnoses for General Medicine (Table IV)

For medical admissions, the A&E medical officers could make an accurate diagnosis in 77.6% of instances. The majority of inaccurate diagnoses were those with broad symptomatology, for example:

- a) prolonged fever for investigation – 1 patient, found to have a urinary tract infection
- b) anaemia for investigation – 2 patients, one with aplastic anaemia, one with anaemia from menorrhagia.
- c) syncope for investigation – 2 patients, one with concussion, one with vertebrobasilar insufficiency.
- d) giddiness for investigation – 1 patient, found later to have postural hypotension.
- e) acute confusional state – 1 patient, later found to have bronchopneumonia.

- f) fits for investigation – 1 patient, later diagnosed to be epileptic.

These conditions often needed more extensive work-up than what was available in the emergency room, and admissions were deemed justified. The majority of such patients did turn out to have a significant illness after work up. Even so, the A&E medical officers could come up with some difficult diagnoses. For example, one patient with systemic lupus erythematosus and nephrotic syndrome was detected. A new case of myeloproliferative disease was diagnosed clinically, and also a case of undiagnosed thyrotoxicosis.

3) Accuracy of Emergency Room diagnoses for General Surgery (Table IV)

The accuracy of surgical admissions was 82.9%. There were four patients who were admitted for observation for head injury. The rest of the admissions were not trauma-related. The majority of these patients had clear-cut diagnoses; for example, perianal abscesses (3 patients), soft tissue infections (2 patients), strangulated inguinal hernia (one patient), and post-operative wound infection (one patient).

By far, the most difficult diagnoses involved patients with abdominal pain of acute onset. There were 5 patients (14.3%) who were admitted for acute abdomen. Three of these patients had admission diagnoses of acute appendicitis, but they improved under observation and were discharged with diagnoses of abdominal colic. One patient was admitted with the diagnosis 'abdominal pain for investigation' and was found to be having ureteric colic. The last patient was found to have bronchopneumonia; the Emergency Room medical officer had wrongly diagnosed perforated gastric ulcer. In contrast, a case of biliary colic with pancreatic pseudocyst was accurately diagnosed by an Emergency Room medical officer.

4) Accuracy of Emergency Room diagnoses for Orthopaedic Surgery (Table IV)

The accuracy for Orthopaedic admissions was 95.8%. This high figure could be attained because the majority of emergency admissions to that department were trauma related and fractures (12 cases or 50%) and dislocations (one case or 4.3%) are often picked up on X-rays. There were also three (12.8%) patients with acute knee haemarthroses. The majority of non traumatic illnesses were diabetic foot afflictions (2 patients or 8.5%) or cellulitis (2 cases or 8.5%).

5) Emergency Room diagnoses not commented upon by the inpatient department doctors.

There were 11 diagnoses not commented upon by the inpatient department doctors (Table V). All of these were diagnoses made in addition to the main diagnosis for which admission was indicated.

Some of these were chronic, non-urgent problems (eg knee osteoarthritis, utero-vaginal prolapse), for which treatment was probably not necessary. As such, the inpatient doctors may have decided not to pursue the diagnosis. For example, the patient with utero-vaginal prolapse was elderly and bedridden, and would probably be best left alone. Other problems settled spontaneously with observation and symptomatic treatment (eg one patient whose vertigo resolved in the ward, and one demented patient whose fever resolved with observation), and no cause could be found.

Table V – Admission diagnoses not pursued by the inpatient departments

Discipline	Diagnosis	Comment
General Medicine	Heart failure and osteoarthritis of the knees	Osteoarthritis of the knees not commented on in case notes
	Uncontrolled hypertension and vertigo for investigation	Vertigo resolved in ward, diagnosis not made
	Uncontrolled diabetes and uterovaginal prolapse	Uterovaginal prolapse not commented on in case notes
	Dementia and prolonged fever for investigation	Prolonged fever settled after 2 days, no source found
	Pneumonia and urinary incontinence	Urinary incontinence not commented on in case notes
	Uncontrolled diabetes and vomiting for investigation	No cause found for vomiting, settled in ward after symptomatic treatment
	Gastroenteritis and syncope	No cause found for syncope, not pursued further
	Lung cancer with possible liver metastases	Discharged against medical advice after 2 days stay, liver problem not pursued
General Surgery	Head injury with fever of unknown origin	Transferred to Neuro-surgery unit in another hospital urgently for further management, unable to pursue fever workup
Orthopaedic Surgery	Fracture humerus with chipped incisor	Dental problem not pursued in case notes

6) Number of admitted cases for which Emergency Room Senior Staff were consulted.

Except for one orthopaedic patient with crush injury of a foot, the medical officers did not seek senior staff consultation. As such, no firm conclusions could be drawn as to whether senior staff's input could improve the diagnostic accuracy (Table VI).

Table VI – Consultations with Emergency Room Senior Staff

Discipline	No. of cases for which senior staff were consulted	
	Yes	No
General Medicine	0 (0%)	73 (100%)
General Surgery	0 (0%)	26 (100%)
Orthopaedic Surgery	1 (4.3%)	22 (95.7%)

7) Comparison of accuracy of admission diagnoses made by junior and senior medical officers / trainees

We also assessed the performance of the four senior (fourth year and above) medical officers, who were also

Table VII – Accuracy of diagnoses made by Senior and Junior Medical Officers

Seniority of Medical Officers	Diagnoses made		Total
	No. of accurate diagnoses	No. of inaccurate diagnoses	
Senior Medical Officers/Trainees	31 (93.9%)	2 (6.1%)	33 (100%)
Junior Medical Officers	48 (80%)	12 (20%)	60 (100%)

(Fisher's exact probability test: $p = 0.006$)

trainees, against the most junior non-trainee medical officers (in this case, the four second-year medical officers). The two groups offered a total of 93 diagnoses.

As shown in Table VII, out of 33 diagnoses made by the senior medical officers, 31 (93.9%) were accurate and only 2 (6.1%) were inaccurate. Out of the 60 diagnoses made by junior medical officers, 48 (80%) were accurate and 12 (20%) were inaccurate. The Fisher's Exact Probability test of significance was carried out and the difference observed was statistically significant ($p = 0.00625$).

8) Accuracy of A&E diagnoses in cases with poor history

It is not uncommon to encounter patients in the A&E who cannot provide a useful history. In the audit week, 27 such patients (17 medical patients, 5 surgical patients and 5 orthopaedic patients) were encountered (Table VIII). They could not give any history, or the history was obtained with difficulty (language barriers, acutely confused patients) or from sources other than the immediate family (eg, bystanders or eyewitnesses).

The two patients admitted to General Medicine with no history but with accurate diagnoses were suspected by the A&E medical officers to have taken overdoses of sedatives/hypnotics. These were confirmed later when both patients admitted to overdose with diazepam after regaining consciousness.

The one patient admitted to General Surgery for whom no history was obtainable was found to have a head injury by the A&E medical officers.

All five patients admitted to Orthopaedic Surgery were foreign workers and the A&E medical officers had difficulty communicating with them. However, they all had industrial injuries which were clinically obvious and hence easily diagnosed.

Table VIII – Diagnoses in patients with poor history

Discipline	Poor history	No. of accurate diagnosis	No. of inaccurate diagnosis
General Medicine (n = 17)	Difficult history	12	1
	No history	2	2
General Surgery (n = 5)	Difficult history	2	2
	No history	1	--
Orthopaedic Surgery (n=5)	Difficult history	5	--
	No history	--	--
Total number	27 (100%)	22 (81.5%)	5 (18.5%)

Table VIIIa – Diagnoses in patients with a good history

Discipline	No of accurate diagnoses	No of inaccurate diagnoses
General Medicine	69	13
General Surgery	26	2
Orthopaedic Surgery	18	0
Total number	113	15

A comparison in accuracy of diagnoses was carried out between the group for which a good history was obtained, and the group for which a poor history was obtained. After disregarding the diagnoses which were not followed up by the ward doctors, the following two-by-two table was constructed (Table VIIIb).

Table VIIIb - Effect of good and poor history on accuracy of diagnoses

History-taking	Diagnoses made		Total
	No. of accurate diagnoses	No. of inaccurate diagnoses	
Good history	113 (88.3%)	15 (11.7%)	128 (100%)
Poor history	22 (81.5%)	5 (18.5%)	27 (100%)

(Fisher's Exact Probability Test: p=0.251)

Comparison of the group with good history and that with poor history showed a slightly higher proportion of accurate diagnoses in the former (88.3%, 113 accurate diagnoses) than in the latter (81.5%, 22 accurate diagnoses). However, the Fisher's Exact Probability test showed this observed difference was not statistically significant (p = 0.251).

9) Usage of investigations in diagnosis

General Medicine

The diversity of medical conditions encountered in the 73 patients, and the multitude of investigations ordered made it difficult to comment on the usefulness of these investigations in making an accurate diagnosis. Notwithstanding this, some idea of the usage of investigations is still possible. The 73 patients were assessed on a case by case basis. Each case was audited by the senior staff of the A&E department, and based on the A&E notes, the investigations were then deemed either appropriate or inappropriate. This was determined by the clinical indications from the history-taking and physical examination which the senior staff obtained from the A&E case records. Even if an investigation was normal, it was still deemed appropriate if the purpose was to exclude a differential diagnosis.

It was found that the medical officers could make an accurate diagnosis in 25 patients (34.2%) without the help of any investigations. Three patients (4.1%) who had inaccurate diagnoses made also did not have any investigations (Table IX).

Of the remaining 45 patients, investigations were helpful in making a diagnosis or in assessing the severity of a correctly diagnosed illness for 27 patients (36.9%). Eleven patients (15.1%) had wrong diagnoses made even after investigations. However, these investigations were deemed appropriate as they were for the purpose of excluding important differentials. Investigation for seven patients (9.6%) were deemed to be not helpful in diagnosis

Table IX – Use of investigations in medical cases

	No. of Patients with Accurate diagnosis		No. of Patients with Inaccurate diagnosis	
	Appropriate Inv.	Inappropriate Inv.	Appropriate Inv.	Inappropriate Inv.
Investigations Done	27/73 (36.9%)	–	11/73 (15.2%)	7/73 (9.6%)
No investigations	25/73 (34.2%)		3/73 (4.1%)	

or in excluding differential diagnoses.

General Surgery

The medical officers could come to an accurate diagnosis in 12 of the 26 cases without any investigations (Table X). These were mainly soft tissue infections⁽⁶⁾, but there were two cases of appendicitis, and one case of strangulated hernia.

Ten cases that were accurately diagnosed had investigations done, all of which were deemed appropriate during our audit. Four cases were head injuries that had skull X-rays. Three cases had ureteric colic, for which urine labsticks and plain abdominal films were done. Two patients had intestinal obstruction, and air-fluid levels were seen on their erect abdominal films. The last patient had acute appendicitis, and his full blood count showed a leukocytosis.

Two cases of inaccurate diagnoses had abdominal X-rays done, but these were not helpful (one case of suspected perforated gastric ulcer which turned out to be bronchopneumonia, and one case of colic).

Two cases of inaccurate diagnoses had no investigations done (acute abdomen which turned out to be renal colic, and a case of undiagnosed appendicitis). In retrospect, the first diagnosis could have been made at the A&E department if a urine labstick had been performed to show haematuria. It is debatable as to whether a full blood count would have helped in making the diagnosis of acute appendicitis for the second patient, as he was afebrile, and there was no abdominal tenderness or guarding at the time of clinical examination by the A&E medical officer.

Table X – Use of investigations in surgical cases

	No. of patients with accurate diagnosis		No. of patients with inaccurate diagnosis	
	Appropriate inv.	Inappropriate inv.	Appropriate inv.	Inappropriate inv.
Investigations Done	10/26 (38.5%)	–	–	2/26 (7.7%)
No investigations	12/26 (46.1%)		2/26 (7.7%)	

Orthopaedic Surgery

Of the 23 orthopaedic patients who were admitted, 4 patients had diabetic foot afflictions or other soft tissue infections, and investigations were not needed to make the diagnosis.

Of the remaining 19 patients, 18 had sustained traumatic limb injuries and radiological studies were done to exclude underlying fractures (Table XI). Twelve patients were confirmed to have fractures. Radiological investigations for the other 6 patients were deemed

Table XI - Use of investigations in orthopaedic cases

Investigations done	No. of patients with accurate diagnosis		No. of patients with inaccurate diagnosis	
	Appropriate inv.	Inappropriate inv.	Appropriate inv.	Inappropriate inv.
Investigations done	19/23 (82.6%)	0	0	0
No investigations	4/23 (17.4%)		0	

necessary and appropriate as their purpose was to exclude underlying bony lesions (3 limb contusions with bruising and swelling, and 3 cases of haemarthroses of the knee). One patient had severe backache and X-rays were done to exclude underlying bony lesions.

In summary, based on the clinical features of these patients, no unnecessary radiological investigations were done.

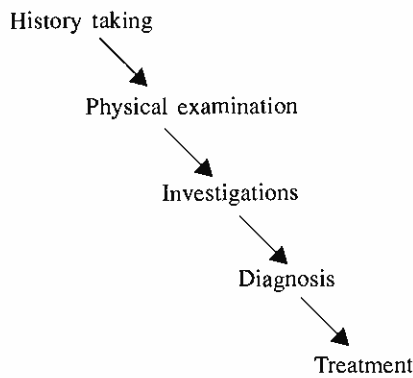
DISCUSSION

1) Different approaches to diagnosis and treatment

Emergency department doctors (not only in Toa Payoh Hospital, but also in other hospitals in Singapore) are frequently exposed to comments that their diagnoses are inaccurate. Our own personal observations, however, differ from those of our colleagues who do not work in the Accident and Emergency Department. Perhaps, this can be explained by the confusion over performance models, as explained by Mellick, van Stralen, and Perkin⁽¹⁾.

a) The deterministic model

Fig 1 – The deterministic model



Traditionally, the practice of Medicine has developed from a deterministic model (Fig 1), in which diagnostic techniques are used to identify diseases before specific therapies are instituted. These techniques follow the 'traditional' sequence of a good history taking, a proper physical examination, followed by laboratory and radiological investigations as deemed appropriate. A prolonged period of observation may also allow certain diseases to come to light as their natural history progresses. Treatment then follows.

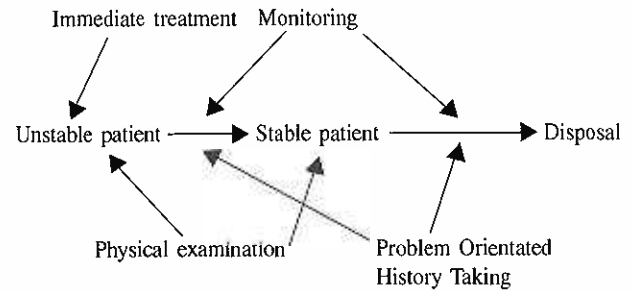
This model is the main method of practice adopted by doctors who work in hospital wards and clinic services, and is the method taught to our medical students during their training.

In the rapidly deteriorating patients without an observed clinical course and an inadequate history, a

different decision making model is needed (Fig 2). Most emergency conditions are, by necessity, approached from inference or conjecture and not from deterministic decision making. In the A&E, diagnostic and therapeutic decisions are made simultaneously and interdependently. This approach is aimed at stabilisation of the patient before diagnosis. This approach is the main thrust of emergency room medicine.

b) The tactical performance model

Fig 2 – The tactical performance model



2) Implications of failure to understand the different approaches

Due to an inadequate understanding of these differences, problems arise when house staff from other disciplines decide that their performance model must be applied to the Accident & Emergency environment. Patients who come out from the Accident & Emergency Department to the wards were deemed "incompletely evaluated" and diagnoses would more often than not initially appear wrong.

3) Need for audit of accuracy of diagnoses made by the Accident and Emergency department

Although there have been previous audits done in the Accident & Emergency department, (for example, Stonebridge's audit⁽²⁾ on computer-aided diagnosis of abdominal pain, and Luke's audit⁽³⁾ on the diagnosis of non-traumatic chest pain), we were unable to find any published audit to date that reviewed the accuracy of diagnoses made by emergency room doctors for admitted patients, either in local or international journals. Hence, we could not make any comparison. Thus, it was with the intent of gathering specific criteria to assess our diagnostic accuracy that we embarked on this audit. The results bear out the view that emergency room doctors could make safe and reliable diagnoses in the majority of patients.

4) Accuracy of Emergency Room admissions and diagnosis

The vast majority of patients were correctly admitted to the various specialty wards (96.2% for General Surgery, 97.3% for General Medicine and 100% for Orthopaedic admissions).

We found that there were no prior standards set for accuracy of diagnoses for patients admitted from the Accident and Emergency Department that we could adopt. As such, we decided to define the following standards:

- more than 90% - very high accuracy
- 80 - 90% - high accuracy
- 70 - 80% - acceptable accuracy
- 60 - 70% - not accurate enough
- less than 60% - unacceptable

These standards were adopted for the purpose of quality control within our A&E department. Using these standards, there was very high accuracy for Orthopaedic Surgery admissions (95.8%), high accuracy for General Surgical admissions (82.9%) and an acceptable level of accuracy for General Medicine (77.6%).

We were able to identify at least one weak point of the medical officers in our audit. This involved the diagnosis of the acute abdomen, for which there were 5 cases (14.3%) of inaccurate emergency room diagnoses.

5) Other findings of the audit

Overall, usage of investigations were justified, either in coming to a diagnosis or to exclude important differentials or complications.

We also found that A&E medical officers were able to hold their own most of the time without consulting the senior staff of the A&E.

History taking can be difficult in the Accident and Emergency department for a multitude of reasons eg. intoxicated state, comatose patient, patients who are too ill to talk, etc. For patients in whom a good history could not be obtained, the A&E doctors were able to make accurate diagnoses in 81.5% of cases overall. There was no statistical difference found in the accuracy of diagnoses made between patients in whom a good history could be obtained, and those in whom a poor history was obtained.

There was a statistically significant difference in the accuracy of diagnoses made by junior medical officers and senior medical officers / trainees. It would seem that their wider experience and their training helped the senior medical officers / trainees in arriving at a better clinical judgement.

6) Shortcomings of study

As mentioned earlier, we based our comparison on the necessary assumption that the ward diagnoses at discharge were accurate. There may have been cases where the ward diagnoses were wrong, in which case the comparison would have been invalid. We kept such cases to a minimum by following up on the patients' progress at the outpatient clinics and checking up on previous admission notes, to make sure that the discharge diagnoses were as accurate as possible.

Another factor that may influence the outcome was the fact that the medical officers knew they were under audit. They could have put in more time and effort in arriving at diagnosis during this period.

It may not be possible to extrapolate the performance of Toa Payoh Hospital's Accident and Emergency Department to other hospitals. For example, we do not

have ophthalmologic or paediatric admissions to our hospitals. This may affect our comparison with hospitals which have the above services. Nevertheless, it will be interesting to see if other emergency departments can also gather similar data to prove or disprove that emergency room diagnoses are sufficiently accurate.

CONCLUSION

It is the purpose of this audit to gauge the degree of accuracy so as to assess how well Accident and Emergency medical officers perform, given the limitations in the Accident & Emergency Department. As this type of audit is the first to be published, we have no other data to compare with.

There were high degrees of accuracy for the surgical disciplines (82.9% for General Surgery, 95.8% for Orthopaedic Surgery), and a fairly high degree of accuracy (77.6%) for General Medicine. We were also able to identify at least one weak point of the medical officers in our audit, namely in the diagnosis of the acute abdomen. Also, usage of investigations in the Accident and Emergency department were often appropriate, either in arriving at a diagnosis or to exclude important differentials or complications. There was no significant difference between the accuracy of diagnoses of patients with a good history, and those in which a history was difficult or impossible to obtain.

From our analysis, as a group, senior medical officers / trainees were able to make more accurate diagnoses than their junior counterparts. This observed difference was statistically significant. Thus, we need to consider providing more guidance for the junior medical officers working in our Emergency Rooms. We hope to repeat this aspect of the study with a larger group in the future, in order to verify our observation.

With these results, future comparison between hospitals and between different batches of Medical Officers may become feasible. There may be more data to determine what are acceptable degrees of accuracy in diagnosis at admission. This can be used as a performance indicator for the Accident and Emergency departments. The 3-digit ICD coding system can be used for computerised input of data for ease of audit.

REFERENCES

1. Mellick LB, van Stralen D, Perkin R. The role of emergency medicine in a teaching hospital: Decision making in an uncontrolled environment. *Am J Emerg Med* 1993; 11:187.
- 2) Stonebridge PA, Freeland P, Rainey JB, Macleod DAD. Audit of computer-aided diagnosis of abdominal pain in accident and emergency departments. *Arch Emerg Med* 1992; 9:271-3.
- 3) Luke LC, Cusack S, Smith H, Robertson CE, Little K. Non-traumatic chest pain in young adults: a medical audit. *Arch Emerg Med* 1990; 7:183-8.