ORIGINAL ARTICLE

Emergency nurse practitioners: a three part study in clinical and cost effectiveness

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Aims: To compare the clinical effectiveness and costs of minor injury services provided by nurse practitioners with minor injury care provided by an accident and emergency (A&E) department.

Methods: A three part prospective study in a city where an A&E department was closing and being replaced by a nurse led minor injury unit (MIU). The first part of the study took a sample of patients attending the A&E department. The second part of the study was a sample of patients from a nurse led MIU that had replaced the A&E department. In each of these samples the clinical effectiveness was judged by comparing the "gold standard" of a research assessment with the clinical assessment. Primary outcome measures were the number of errors in clinical assessment, treatment, and disposal. The third part of the study used routine data whose collection had been prospectively configured to assess the costs and cost consequences of both models of care.

Results: The minor injury unit produced a safe service where the total package of care was equal to or in some cases better than the A&E care. Significant process errors were made in 191 of 1447 (13.2%) patients treated by medical staff in the A&E department and 126 of 1313 (9.6%) of patients treated by nurse practitioners in the MIU. Very significant errors were rare (one error). Waiting times were much better at the MIU (mean MIU 19 minutes, A&E department 56.4 minutes). The revenue costs were greater in the MIU (MIU £41.1, A&E department £40.01) and there was a great difference in the rates of follow up and with the nurses referring 47% of patients for follow up and the A&E department referring only 27%. Thus the costs and cost consequences were greater for MIU care compared with A&E care (MIU £12.7 per minor injury case, A&E department £9.66 per minor injury case).

Conclusion: A nurse practitioner minor injury service can provide a safe and effective service for the treatment of minor injury. However, the costs of such a service are greater and there seems to be an increased use of outpatient services.

The use of nurse practitioners for the treatment of many conditions is increasing.[1–8] Recent attention has focused on the effectiveness of nurse practitioners in the primary care setting.[9 10] There has been research into some aspects of the role of nurse practitioners in accident and emergency (A&E) and minor injury settings.[11–16] It is therefore surprising that there is little evidence about the clinical effectiveness and cost effectiveness of this model of care compared with more traditional models of care.[9 10 17–19] As part of the reorganisation of A&E services in the city of Sheffield (UK) it was planned to introduce a nurse practitioner led minor injury unit (MIU) when one of the A&E departments in the city was closed. Previous studies have shown high levels of patient satisfaction[13 20 21] with MIUs but there is little evidence of the clinical and cost effectiveness. The replacement of a 12 hour per day A&E department with an MIU provided a major opportunity to examine these questions. This study is a before and after cohort study comparing nurse led MIU care with doctor led A&E department care. We also took the opportunity to perform a prospective randomised trial of the care provided by ENPs compared with senior house officers both working within in an A&E department and this has been published.[22] The patients reported in this study are different to those of the randomised trial.

Increasing emphasis is being placed on the role of nurses in the NHS. However, the clinical and cost consequences of this policy are not clear and thus we feel that this study is timely and important.

METHODS

Overview

The clinical effectiveness study took a sample of patients with minor injuries attending the A&E department in 1996 and a second sample of patients attending the MIU in 1997. Each of these samples were subjected to a "double examination" and the findings compared.

The cost study used the dataset on all patients attending the A&E department in the financial year 1996/1997 and in the MIU in 1997/98. These data were adjusted for casemix differences to derive a "cost per workload unit".

The cost consequences of follow up care were calculated from a second sample of patients to provide information on the follow up rates in each setting. Using actual costs of follow up visits, the total costs of follow up for minor injury patients in each setting were calculated.

Clinical effectiveness study

During 1996 the Royal Hallamshire Hospital (RHH) provided an A&E service 12 hours per day 7 days per week. After May 1997 this service was replaced by a nurse led MIU staffed and operated by nurse practitioners who rotated between the main adult A&E unit at the Northern General Hospital (NGH) and the MIU.

During the period from 7 August 1996 to 19 November 1996, 1447 patients with minor injuries attending the RHH A&E department were subjected to two examinations. The first was by the A&E doctor and then by one of two investigators. The investigators used pre-designed forms that recorded the "ideal" history and examination for the patient and the registrar made a judgement whether investigations were needed along with the treatment and follow up care needed. These decisions were based on departmental guidelines and "decision rules". The A&E doctor was not aware of the findings of the research assessment and the researcher did not interfere in any clinical decision that was made. Further details of this methodology have been previously published.[22]

STEP 1 Calculate total workload units

Number of resuscitation cases	× HRG multiplier (2.31)	= workload units for resuscitation cases
Number of admitted patients	× HRG multiplier (1.74)	= workload units for admitted patients
Number of outpatient cases	× HRG multiplier (0.91)	= workload units for outpatient cases
Number discharged/GP	× HRG multiplier (0.75)	= workload units for discharged/gp cases
Number of other	× HRG multiplier (0.56)	= workload units for other cases

TOTAL WORKLOAD UNITS =

STEP 2 Calculate cost per workload unit.

COST PER WORKLOAD UNIT = TOTAL COSTS/TOTAL WORKLOAD UNITS

Figure 1 Summary of cost comparison method.

During the period 1 September 1997 to 31 January 1998 the same process was undertaken in the nurse led MIU and 1315 patients with minor injury were doubly examined firstly by the nurse and then by the research investigators.

At the end of the study the research investigators compared the "research assessment" as recorded in the research proforma with the "clinical assessment" as recorded in the A&E notes. The radiologist report was used as the "gold standard" against which radiological interpretation was judged. Errors were judged as "not clinically significant", for example where a patient had not been asked tetanus immunisation status but was up to date with tetanus immunisation and therefore no treatment would have been needed. A "clinically significant error" was judged to have occurred if the treatment would have been different had the error not been made, for example where tetanus status was not asked but the patient needed an immunisation and this was not given. A "very significant error " was judged as one where there was a high risk of adverse outcome for the patient, for example where a tendon injury was missed.

Each separate part of the care was judged in this manner (history of the injury, previous medical history, examination, need for radiography, interpretation of radiograph, treatment, and ongoing care plan). Waiting time to see the clinician and department time were also recorded.

Cost study

When the changes to A&E services were announced steps were taken to harmonise the data collection and coding systems of the hospitals. During 1996 the RHH A&E department came under the managerial control of the NGH and thus accounting systems were also harmonised. Steps were taken prospectively to improve the completeness and accuracy of this routine data collection.

Revenue cost information was obtained directly from the costs of running the A&E service for the period April 1996 to end March 1997. Annual cost data for the MIU were calculated from the costs for the 11 month period May 1997 to March 1998 (the MIU opened on 1 May 1997). Budget lines were checked to ensure conformity. The costs for the A&E unit were adjusted for inflation (pay 2.5% and non-pay 0.4%). Costs included staff costs, investigations such as radiography, drugs, and disposable items.

Numbers of patients attending both departments were obtained for a one year period. However, the costs of treating the more complex cases attending an A&E department are greater than those for patients with minor problems who are discharged. Various methods have been used to adjust for the A&E resource use of different groups of A&E patients.[23] The NHS Information Authority has produced Health care Resource Groups (HRG) at discharge disposal for this purpose. We have used these as at the time the study took place they seem to be the best validated measure. Very recently these have been further updated.[24] The HRG methodology assigns a "multiplier" to be applied to the numbers of new patients attending a department that should correct for the difference in casemix. The multipliers used and the method were "minor case sent home" 0.75, referred to clinic 0.91, admitted 1.74 and died 2.31, and other 0.56 . This allowed a revenue "cost per workload unit" to be calculated. These costs included investigation and treatment costs as well as the cost of patients reviewed within each department.

The cost consequences of planned follow up care were assessed in the following way. The database provided details of the intended follow up arrangements of patients. In the case of the A&E department the database was filtered to provide a dataset of all those patients with minor injury. The data collection forms for routine coding are clearly divided into "injury" and "non-injury" sections. We selected those patients with "injury "codes from both units but excluded those brought by ambulance. The same filters were applied to the MIU dataset. The follow up rates for general practice, outpatient clinic, and for the MIU main A&E review clinic were obtained. Costs estimates for each clinic were obtained from hospital accountants and for general practice from previously published data.[25] This then permitted the calculation of an extra cost of follow up per new "filtered" minor injury patient.

Analysis

Error rates (proportions of cases with errors judged by the "gold standard" of the research form/radiologist report) were compared using the χ^2 test. There were some differences in the casemix of patients in the groups mainly the location and type of injury. To adjust for these differences we used logistic regression analysis taking into consideration most possible confounders (age, sex, type, and location of injuries). For quantitative data such as age, waiting time, department times we used the *t* test to compare the means with 95% confidence intervals. All tests used were two tailed unless stated otherwise.

RESULTS

Effectiveness study

A sample of 1500 patients with minor injury were included in the A&E department arm of the study and 1447 were analysed, the remaining 53 (3.5%) were not included in the analysis because of lost clinical notes or part of the notes. A total of 1315 patient were included in the MIU arm. In the A&E department phase 1062 patients were seen by senior house officers, 297 by registrars, senior SHOs or consultants, and 58 by general practitioners. The groups were comparable in the age, sex, method of presentation (walking wounded or with recent minor injury), and triage category 4 (table 1). All patients who presented as 999 call even with minor injuries were excluded. There was a trend for more MIU patients to be female but this failed to reach significance (p=0.06). There was also some differences in the types of diagnosis and the

Table 1 Baseline characteristics of patients included in the clinical efficiency study

	A&E department	MIU	Statistic	p Value
Total	1447	1315		
Patients age				
Minimum	16	16		
Maximum	90	89		
Mean	37	38	t=–1.6	0.1 CI–2.39 to +0.22
Patient sex				
M	842 (58.2%)	720 (54.8%)	χ^2=3.3	0.06
F	605 (41.8%)	595 (45.2%)		
Triage category				
Green	1436 (99.2%)	1315 (100%)		
Others	11			
Clinician seen				
SHO	1062	ENPs 1315		
GP	58			
Senior	297			
Unknown	30			

Table 2 Numbers (%) of patients with clinically significant errors. In some patients errors may have been made in more than one category

	A&E n=1447	MIU n=1315	p Value
Number of patients with at least one significant error	191 (13.2)	126 (9.6)	0.003
Errors in history of injury	2 (0.15)	1 (0.1)	0.9
Errors in past medical history	32 (2.2)	5 (0.4)	<0.0001
Errors in examination	28 (1.8)	43 (3.3)	<0.03
Errors in follow up	48 (3.3)	42 (3.2)	0.9
Errors in treatment	60 (4)	42 (3.2)	0.2
Errors in radiological intrpretation			
false –ve	9 (0.6)	4 (0.3)	
false +ve	4 (0.3)	6 (0.4)	0.7

Table 3 Calculation of number of "workload units" for A&E department and MIU

Disposal	Patients A&E (n)	Patients MIU (n)	NCO multipier	Workload units A&E	Workload units MIU
Discharge/GP	25518	8508	0.75	19138	6381
Clinic	5585	4362	0.91	5082	3969
Admit	5656	474	1.74	9841	825
Died (resus)	177	0	2.31	409	0
Other	491	275	0.56	275	154
Total	37427	13616		34745	11329

areas of the body examined mainly more chest (A&E department 2.4%, MIU 0.3%) and head injuries (A&E department 6.4%, MIU4.1%). After initial analysis of the results we have also performed further analysis using logistic regression to adjust for these differences and to eliminate any confounding factors (table 6 on web site appendix).

Significant errors in any of the measures in the process of care (apart from too many radiographs) occurred in 191 (13.2%) of patients treated in the A&E department and 126 (9.6%) in the MIU (p=0.003). In some patients more than one error was made. Table 2 shows the error rate for each of type of error. Significant findings are that the nurses were better at recording a past medical history. The A&E department staff seemed to be better in examining the patient. However, after adjusting for the differences between the groups this was not statistically significant. Both groups requested many more radiographs than the research investigators thought necessary. There was no difference in the accuracy of radiological interpretation or treatment. Follow up was thought to be inappropriate in 3.2% MIU patients and 3.3% A&E department patients. There was only one "very significant error", a missed tendon injury in the A&E department group. Waiting times were very much better in the MIU group. The mean waiting time for patients presenting to the MIU was 19 minutes while for those presenting to A&E department the mean waiting time was 56.4 minutes (p<0.0001, 95% CI of the difference 34.48 to 39.32). The total time spent in the department was also much shorter for patients presenting to the MIU (mean 51.5 minutes compared with 95.4 minutes for the A&E department p<0.0001 95% CI 36.27 to 42.75) (tables 2 and 3).

Cost analysis

During the year 37 427 patients attended the RHH A&E department and 13 616 the MIU. After applying the "multipliers" the number of "workload units" was 34 751 for the RHH A&E department and 11 329 for MIU (table 3). The costs for each unit are given in table 4. The revenue cost per "A&E department workload unit" using HRG methodology is £40.01 for A&E department care and £41.10 for MIU care.

Table 4 Costs for A&E/MIU (A&E uplifted for inflation at 2.5% pay and 0.4% non-pay)

	A&E	MIU
Pay	950049	253776
Non-pay	443299	210828
Total	1393348	464604

Application of the "minor injury filter" to the both the A&E department and MIU patients yielded 17 909 patients attending the A&E department with minor injuries and 11 889 for the MIU. Analysis does show differences in casemix with more head/neck/trunk injuries in the RHH A&E dataset and more hand injuries in the MIU dataset. The MIU saw more cuts and less sprains and strains than the RHH A&E department.

The follow up rates for these patients were calculated for all clinics and there was a significant increase in referrals to general practice, fracture clinic, and eye casualty for patients treated in the MIU. In addition, more patients were being referred to the A&E department clinics. Cost for the returns to the A&E department and MIU are included within the total revenue costs given above. The follow up rates are given in table 5 along with the costs of outpatient attendances. This allows a calculation to be made of the total cost of referrals from each unit and thus an average "cost per case" for referrals can be calculated.

This table shows the total annual initial follow up costs of an MIU visit as £144 730 or £12.17 per "filtered minor injury case" and for the RHH A&E £164 923 or £9.66 per "filtered minor injury case".

DISCUSSION

The reorganisation of A&E services causes heated debate, often without any evidence behind very emotive arguments. We have studied the effects of the changes in Sheffield in great detail and have published results on the changes to patient flows, process quality data, and overall revenue costs,[26] details of the effects on the care of patients needing thrombolysis,[27] and are preparing work on the impact of the changes on the care of patients with serious injury. The use of nurse practitioners has been widely advocated as a solution to many problems but it is only recently that evidence on the effectiveness of emergency nurse practitioners in an A&E department setting has been published.[22] This trial compared the care of minor injury provided within the A&E department by A&E senior house officers or nurse practitioners. The study found that the nurse practitioner care was as good as that provided by SHOs. Measures such as patient reported outcome at 28 days showed no differences between the groups but patients in the nurse practitioner group had fewer unplanned follow up visits. However, the setting for this trial was an A&E department and therefore we thought it important to assess the care provided in the MIU setting.

The error rates for the "package of care" show significantly less process errors in the MIU patients ($p=0.003$). The error rate seems to be high but this is a comparison of real clinical situations against a very rigorous "gold standard". Obviously where a significant error was made there was the potential for the patient to suffer an adverse effect. Very significant errors with a high probability of adverse outcome were very rare (one case).

There were differences in individual elements of the package of care. Past history was more frequently recorded in by the nurse practitioners whereas the A&E doctors seemed to have made less errors in examination. However, after adjusting for the differences in the groups this did not reach the statistically significant level ($p=0.075$). There was no difference in radiography requests or interpretation. Errors in treatment were similar in both groups. These trends were all noted in the previous study. The nurses did arrange more follow up but this was judged to be appropriate most of the time. The lack of available senior opinion in the MIU meant that the nursing staff were acting in safe manner by requesting further review.

Our conclusion is that the care provided by emergency nurse practitioners in the MIU is safe and the overall process of care is equal to and in some respects superior to that provided for minor injuries in the A&E department. The waiting times were much less. The nurse practitioners arrange more follow up but this was judged as appropriate given the setting and lack of senior advice.

The cost study was important as many perceive that MIU care is cheaper than A&E department care. It was difficult to make a direct cost comparison between the two groups given the different casemix. The HRG groups are the most widely validated measure of resource use in different types of A&E patients. Using this to adjust the workloads, the costs were almost equal with the A&E being slightly cheaper. The costs in the A&E department include many-non service costs such as educational time for the junior medical staff, teaching time of senior medical staff, research, and management time of senior staff. There was some management time built into the MIU costs but few costs of ongoing education or training. If these factors were to be taken into account the cost differential for the pure patient care parts of the service would have been wider. On the other hand the waiting time figures for the MIU were much better. Therefore some of this extra cost is probably "buying" better quality. Similarly the comparatively less pressured MIU work conditions may allow more time to be spent with patients, better recording of history, and treatment plans. These findings are in line with the use of nurse practitioners in primary care where they tend to spend longer with patients and make less process errors.

Table 5 Costs of extra referrals for 17909 A&E patients with minor injuries and 11889 MIU patients

	Mean cost/pt	A&E referrals (n)	Total cost A&E	MIU referrals (n)	Total cost MIU
General practice	£18*	656	£11808	1197	£21546
NGH A&E direct†	£20	0	0	441	£8820
NGH A&E returns	£15‡	0§	0	369	£5535
Fracture clinic	£55	2518	£138490	1731	£95205
Eye clinic	£46	176	£8096	144	£6624
Other clinic	£50	294	£14700	140	£7000
Total		3644	£173094	2422	£144730

*See reference 23. †These patients were referred directly from MIU to A&E for treatment. ‡Based on consultant/ nurse staffing of clinic and average number of patients. §A&E return costs are included in revenue costing for the A&E unit, as the return costs for MIU are included in revenue costing for MIU.

The A&E department costs include middle grade and consultant staff costs and therefore easy access to senior medical advice in the A&E department cohort. This may account for the lower follow up rate in A&E department patients. The study does not examine some of the quality benefits that may flow from a nurse practitioner service such as increased patient education.

The planned follow up rate for MIU patients was higher than that of the A&E department. Some of this follow up was to the MIU itself and thus the costs would be contained in the MIU costs. However, there were also increased follow up costs is general practice, the main A&E department, and in outpatient clinics. Our previous work did show that junior A&E staff have higher rates of unplanned follow up than nurse practitioners, perhaps indicating a reluctance to arrange follow up where it is needed. We were unable to assess that if unplanned follow up was greater in the A&E cohort in this study. It may be argued that the increased planned follow up represents better care, but the cost to the health service and to the patient in time and transport costs is significant.

Weaknesses of the clinical effectiveness study

A major problem in assessing the quality of care in patients with minor injuries is that there is a low incidence of adverse outcomes in this patient population and while the ideal study would have reviewed every patient at 28 days to assess outcome this was not feasible for large numbers of patients, many with comparatively minor conditions. We therefore chose to examine the process of assessment, treatment, and referral and compare these with a "gold standard" of treatment.

A significant source of bias of the effectiveness study was that the researchers were not blinded to the type of unit. This flaw was one reason we undertook the randomised trial with blinded assessments.[22] It is reassuring that the findings of this trial are similar to those of the blinded study. However, there are some indications that more patients were referred for follow up in the MIU group, this did not account for any increase in the clinically significant errors as patients were not subjected to any increased risk, but has accounted for more use of resources. The knowledge that the A&E staff would have the ability to seek a senior medical opinion on site while the nursing staff did not have this facility may be the reason for these judgements. The lack of blinding could not have affected other process measures such as the accuracy of radiological interpretation. Another weakness in this study is that it was not possible to carry out outcome measurement at 28 days as was done in the randomised study.

Weaknesses of the cost study

Weaknesses of the cost study are that the "cost per minor case" was a derived figure and was not obtained from "bottom up" costing. We did not have the manpower to do such a detailed observational study. However, the findings agree with our previous cost study that did use direct observation of time spend by A&E staff and nurses in assessing these patients and did find that the nurse practitioners took longer to assess patients and salary costs were greater than those of A&E senior house officers. The NCO HRG methodology is the most extensively validated tool available for such cost comparisons. It has been refined very recently but this method was not available at the outset of the study. It has not been validated in an MIU setting and therefore costs such as educational time, teaching, research, and management time that are factored into the A&E budget are not large expenditures in the MIU budget.

This part of the study has not been corrected for the small differences in the patient population that were subject of correction by logistic regression in the effectiveness study. The differences were small and it is the most prominent being an excess of minor head and chest injuries in the A&E department group. It is unlikely that the costs of these injuries would be less than those for other minor injuries or have a major impact on the cost analysis.

SUMMARY

Nurse practitioners working in a MIU provide a clinically safe service. The revenue costs were greater but quality measures such as waiting time were better. There were additional costs attributable to increased follow up rates although again this may indicate better quality of care and prevent the need for unplanned follow up that was found in patients treated by A&E junior staff in our previous study.

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Contributors

MS helped design the research assessment process, collected data in the research assessment process, compared the research and clinical assessments, coordinated follow up information, carried out analysis and wrote the paper. RK helped collect data for the cost study and carried out the analysis and commented on the paper. JA collected data in the research assessment process, compared the research and clinical assessments, coordinated follow up information. AS collected data in the research assessment process, compared the research and clinical assessments, coordinated follow up information. JN helped design the study, helped gain ethical approval, gave statistical advice and helped carry out some of the analyses, assisted in data processing, and helped write the paper. JW conceived the study, designed the study, sought funding, gained ethical approval, helped design the research assessment process, obtained data for the cost study, analysed the data, checked analysis, wrote the paper. JW is the guarantor of the paper.

Additional information regarding this paper is available on the journal web site (www.emjonline.com/supplemental)

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Cyclizine

It has come to our attention that it is common practice within our health authority for paramedics to routinely administer to all patients with suspected cardiac chest pain, a 50 mg intravenous dose of cyclizine, as an antiemetic, in conjunction with the intravenous analgesic nalbuphine. This is the protocol in our area.

We are concerned at the use of a drug likely to increase heart rate and thus myocardial oxygen demand, in patients with an already critically ischaemic myocardium. The vagolytic effects of cyclizine are well known often with a substantial increase in heart rate.[1] Several studies have shown a direct link between myocardial ischaemia and heart rate (hence the beneficial effects of β block on high risk cardiac patients).[2] Indeed the avoidance of tachycardia and hypertension is the principal therapeutic aim of anaesthesia in patients with significant myocardial ischaemia.[3]

In guidelines published by various health authorities on the treatment of acute myocardial infarction, cyclizine is recommended as a first line drug, although a note of caution is suggested in at least one publication if the patient is thought to have left ventricular failure. It would seem to us to be more pertinent to avoid its use in patients at risk of further myocardial damage regardless of their left ventricular function.

The *BNF* reports that cyclizine counteracts haemodynamic effects provided by opioid administration and goes further to state that a common side effect is palpitations and arrythmias, surely neither being beneficial to the patient with chest pain.[4]

In our view the logical antiemetic of choice would be ondansetron, which is effective, if expensive, and devoid of serious common side effects unlike cyclizine and indeed metoclopramide.

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Public health warning: Pancake Day!

The isolated burn of the hand is a typical injury in young children and long term sequelae are not uncommon, particularly after flame and contact burns,[1] which are more prone to scarring. Children under the age of 11 years are more likely to sustain contact burns.

The paediatric accident and emergency department at St Peter's Chertsey opened its doors in the year 2000, in that time we have seen two Shrove Tuesdays (27 February 2001 and 7 March 2000) and two Guy Fawkes nights (5 November).

The number of burns treated on the 5 November totalled two cases (0, 2 respectively) and those treated on Pancake Days totalled five cases (2, 3 respectively), over double. The cases attending on Pancake Days were all burns to the hands from hot frying pan handles. Parents were present on all occasions.

Burn prevention programmes[2] and general prevention ideas such as school lectures and tests[3] need to be improved so as to highlight the risk of burns on any occasion. Regarding frying pans, manufacturers should be made aware of this hazard and look at the possibility of handles that do not conduct heat.

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CORRECTION

An error occurred in this paper by Dr M Sakr and others (2003;**20**:158–63). The correct spelling of the surname of the fourth author should be Sanders (not Saunders).

AUDIT

What is the patient's best telephone number?

Patients who attend the emergency medicine department (ED) may need to be contacted either because more information becomes available after they have left (results of investigations, radiological reports) or they fail to attend for follow up or staff have concerns about them. Typically telephone contact is likely to be made between 0900 and 1700 when EDs are best staffed and results of investigations are available.

We undertook a study to establish if the best telephone number to contact the patient between these times has been obtained by the ED receptionists. A convenience sample of 100 patients aged over 18, who had given the receptionist a contact number were then asked by one of us (LT) to give their best daytime telephone number. In 60 cases this best number corresponded with that recorded by the receptionists. For the remaining 40 patients this was not the case and it is likely that they would have been uncontactable between 0900 to 1700. Twenty four suggested a mobile number, nine a work number, and seven a home number. For the six who gave no contact number to the receptionists (because they believed a home number was being requested) five had mobile phones.

The receptionists then changed their questioning and asked for "the best daytime telephone number". A further 100 patients were then questioned. Eighty eight gave their best number to the receptionists and the proportion of mobile numbers given increased from 6% to 36%. This 28% improvement in patients giving their best number is significant (95% Cl 16.5% to 39.5%) and can be easily obtained.

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