



Correlation of physician seniority with increased emergency department efficiency during a resident doctors' strike

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Abstract

Aim Physician seniority has increasingly been shown to correlate with improved clinical outcomes. However few studies examine the relationship between treating doctor experience and the efficiency of emergency care systems. We explored the hypothesis that increased seniority of emergency department (ED) medical staff would result in improved ED efficiency.

Method This was prospective observational study conducted at the ED of Waikato Hospital, a 650-bed university-affiliated teaching hospital. All patient presentations during a 5-day resident doctors' strike when the ED was staffed by senior physicians, and the corresponding normally staffed days of the subsequent calendar week were examined. Patient waiting times, time seen to disposition, and total ED length of stay were recorded according to Australasian Triage Score (ATS).

Results 608 and 683 patient presentations were recorded during the strike and non-strike period respectively. Waiting times were reduced for ATS3 (43.8 vs 73.6 minutes, $p < 0.001$) and ATS4 (53.7 vs 82.0 minutes, $p < 0.001$) during the strike period. Time seen to disposition were reduced for ATS2 (147.9 vs 255.1 minutes, $p = 0.001$) and ATS3 (119.9 vs 165.0 minutes, $p < 0.001$) during the strike period. ED length of stay was reduced for ATS2 (162.6 vs 278.6 minutes, $p < 0.001$), ATS3 (161.9 vs 238.4 minutes, $p < 0.001$), and ATS4 (134.1 vs 179.2 minutes, $p < 0.001$) during the strike period. No difference was observed in patient walkout, ED mortality, 48-hour mortality, or 30-day unscheduled representation rates.

Conclusions Increasing seniority of front line ED staff during a period of resident doctors' strike action was associated with increased efficiency of ED patient processing. Early specialist involvement with ED patients may replicate these efficiencies during periods of normal departmental operation.

Emergency departments within Australasia and the United Kingdom are staffed predominately with resident medical doctors in training working under the supervision of a specialist consultant. Provision of verbal or bedside advice on patient management and disposition by emergency physicians and inpatient specialists occurs largely at the discretion of the attending resident doctor.

The ad-hoc nature of this consultation may result in inefficiency due to delays in diagnosis, initiation of appropriate management, and disposition decision.

Access block and emergency department (ED) overcrowding are well recognised impediments to emergency care systems on every continent.¹⁻³ Attempting to de-clutter EDs and facilitate patient flow to disposition has become a reality for both clinicians and hospital managers.^{4,5}

Physician experience has increasingly been shown to correlate with improved clinical outcomes in both emergent^{6,7} and non-emergent⁸⁻¹⁰ settings. Additionally, perceived doctor experience has been linked with improvements in patient satisfaction.¹¹

Few studies however exist examining the relationship between treating doctor seniority and the efficiency of emergency care systems. Whilst it might seem intuitive that more experienced physicians respond to a given clinical scenario with more rapid and accurate decision-making as compared less experienced colleagues, data supporting this assumption is limited, and largely based on observational experiments.¹² The potential to improve ED patient flow and minimise ED overcrowding through speeding decision-making processes requires evaluation.

An estimated 2500 junior medical doctors working in New Zealand District Health Board (DHB) hospitals launched strike action during the period 15/6/2006 to 19/6/2006 pursuing improved working conditions and remuneration. During this period, service delivery by all hospital departments was provided by consultant specialists, career medical officers, and non-striking junior doctors.

We were interested to explore the hypothesis that increasing seniority of front-line ED medical staff during the resident doctors' strike would result in improvements in commonly measured markers of ED activity. Specifically, we intended comparing patient waiting times, time seen to disposition, ED length of stay, and utilisation of diagnostic investigations during the period of the resident doctors' strike, with a corresponding interval of normal ED staffing.

Methods

Design—This was a prospective observational study comparing ED activity during the period of a resident doctors' strike with a corresponding non-strike period of the same calendar month.

Study setting—Waikato Hospital is a 650-bed university-affiliated teaching hospital located in the city of Hamilton, New Zealand. The hospital provides tertiary-level adult and paediatric care and serves as the regional trauma centre for a local population of 190,000 and total regional catchment of 650,000. All major specialties are represented on campus. The ED has an annual census of 51,000 of which 20% are paediatric. Admission rate is approximately 35%.

The ED serves as the major admission portal for the hospital, with initial assessment of all self presenting and externally referred patients occurring within the facility. All patient presentations are initially triaged by a senior nurse according to the Australasian Triage Scale (ATS) as defined by the Australasian College for Emergency Medicine.¹³ This triage tool comprises five categories denoting the clinical urgency of presentation (1–5). Adherent to ATS categorisation is a maximum recommended time to initiation of medical assessment and treatment (ATS1 0 min, ATS2 10 min, ATS3 30 min, ATS4 60 min, ATS5 120 min), and institutional performance indicator thresholds representing the recommended percentage of patients seen within the stated target (ATS1 100%, ATS2 80%, ATS3 75%, ATS4 70%, ATS5 70%).

ED doctors, in conjunction with the appropriate inpatient service, initially manage patients of triage category 1 and 2 regardless of referral status. ED doctors additionally assess and manage all self-presenting patients of category 3, 4, and 5. Externally-referred patients (originating from general practitioners or referring hospitals) are managed by the designated specialty service.

Usual ED staffing is by 9 consultant emergency physicians, 13 registrar-level (postgraduate year 4–10) doctors, and four senior house officer (SHO) level (postgraduate year 3) training emergency doctors.

Standard ED staffing during the non-strike period provided a daily average of 111.2 clinical hours (total hours: consultant 216, registrar 323, SHO 75). Non-strike specialty medical staffing of the ED was via the hospital pool of specialty registrars and provided a daily average of 124.8 clinical hours (total hours: medical registrar [general, cardiology, respiratory] 264, paediatric medical registrar 120,

general surgical registrar 120, orthopaedic surgical registrar 120) with additional on-call consultant back-up. Additional specialty registrars attend on an on-call basis.

During the strike period, ED medical staffing was via 10 consultant emergency physicians, 1 career medical officer (CMO), and 3 non-striking registrars providing a daily average of 98.6 clinical hours on a rostered basis (total hours: consultant 359, CMO 20, registrar 114).

Specialty medical staffing of the ED was via the hospital pool of medical and surgical specialists providing a daily average of 128 clinical hours (total hours: physician [general, cardiology, respiratory] 280, paediatrician 120, general surgeon 120, orthopaedic surgeon 120).

Study participants—We utilised the hospital's computerised registration and coding system (HOSPRO) to collect data on all patient presentations during the strike period (0730 hours on 15/6/2006 to 0730hrs on 20/6/2006), and the non-strike period defined as the corresponding days of the subsequent calendar week (0730 hours on 22/6/2006 to 0730 hours on 27/6/2006).

Definitions and outcome measures—Patient records were examined for:

- Date and time of presentation,
- Australasian Triage Score,
- Waiting time until medical assessment (defined as time from patient registration until time seen by a doctor),
- Time seen until disposition (defined as time seen by doctor until time of exit from the ED), and
- ED length of stay (defined as time from registration until exit from the ED).

These key times are recorded routinely on our computerised record. Recordings of requested laboratory haematologic and biochemical blood analysis, in addition to plain film radiology, ultrasound, CT scan, and MRI imaging requests from the ED during the study period were obtained retrospectively. Patients who did not wait until medical assessment; death within the ED and death within 48 hours of hospital admission; and 30-day non-scheduled representation were also recorded retrospectively.

Statistical analysis—Presentation rates according to triage category were computed for five 24-hour periods (commencing at 0730 hours of the first day and corresponding with strike onset) and covering the six calendar days of the strike and non-strike periods (Thursday–Tuesday inclusive).

Statistical analysis of all variables were performed using SPSS for Windows (version 10.0) software (SPSS, Chicago, IL). Two-tailed students-t and Mann-Whitney U testing were used as appropriate to evaluate differences in continuous variables. Chi-squared testing and Fisher's exact testing were used where appropriate to compare dichotomous outcomes. A p value less than 0.05 was deemed significant.

Ethics—Ethical approval for the study was obtained from the Regional Y committee of the New Zealand Health and Disabilities Ethics Committee.

Results

A total of 1291 patient presentations were identified during the strike (SP) and non-strike periods (NSP) (Table 1). No difference was observed in patient age (median 35 years, range 0-91 SP; median 32 years, range 0-97 NSP, $p=0.291$), or male/female ratio (1.06:1 SP; 1.01:1 NSP, $p=0.723$). Patient:clinical hours worked ratio for the strike period and non-strike period were 0.54 and 0.55 respectively.

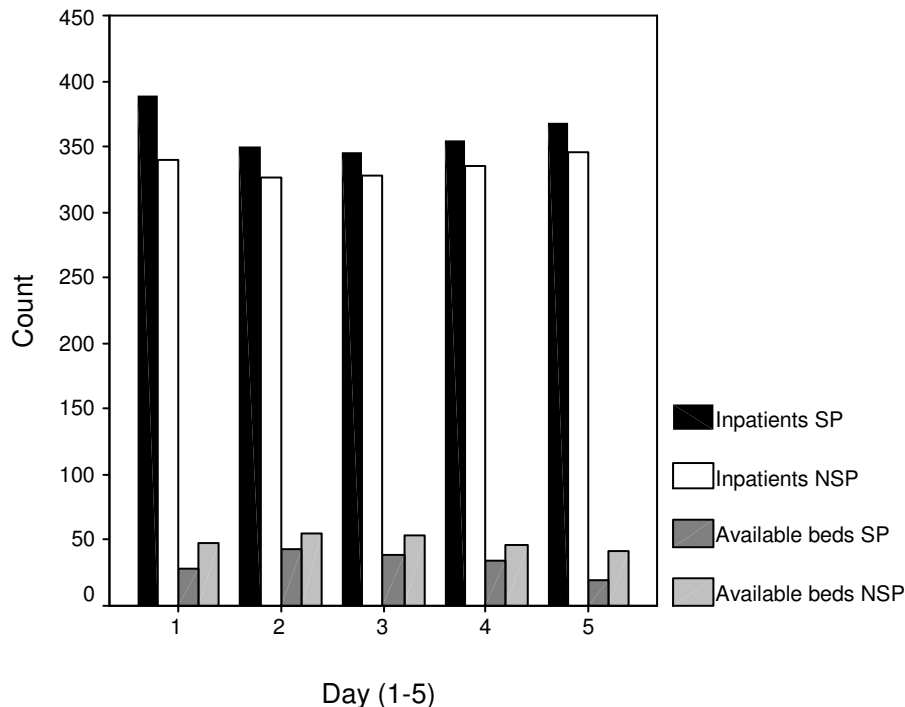
Admission rate according to ATS category were: ATS1 100% for both the SP and NSP; ATS2 81.6% SP vs 89.6% NSP ($p=0.188$); ATS3 56.4% SP vs 65.1% NSP ($p=0.028$); ATS4 34.8% SP vs 38.5% NSP ($p=0.372$); ATS5 10.7% SP vs 11.4% NSP ($p=1.0$).

Hospital inpatient numbers and bed availability as at 0700 hours for the strike period and non-strike period are presented in Figure 1. Daily bed availability during the strike period was less than the non-strike period (33.0 beds SP vs 48.8 beds NSP, 95% CI difference 4.9 to 26.7).

Table 1. Emergency Department presentations

Presentations	Strike period		Non-strike period		P value
	Number	Rate per 24 hours	Number	Rate per 24 hours	
ATS1	3	0.60 (0.49%)	4	0.8 (0.59%)	0.343
ATS2	76	15.2 (12.5%)	96	19.2 (14.1%)	0.323
ATS3	298	59.6 (49.0%)	301	60.2 (44.1%)	0.253
ATS4	203	40.6 (33.4%)	247	49.4 (36.2%)	0.253
ATS5	28	5.6 (4.6%)	35	7.0 (5.1%)	0.712
Total	608	121.6	683	136.6	0.287

Figure 1. Waikato Hospital occupancy and bed availability during strike (SP) and non-strike periods (NSP)



(All data as at 0700 hours)

Wait times according to triage category for all patients are presented in Table 2. The percentage of patients seen within recommended waiting times during the strike period were 0%, 63%, 48%, 66%, and 96% for ATS category 1 to 5 respectively. The percentage of patients seen within recommended waiting times during the non-strike period were 25%, 53%, 38%, 47%, and 91% for ATS category 1 to 5 respectively.

Table 2. Wait times per Australasian Triage Score (ATS) in minutes

Presentations	Strike period		Non-strike period		95% CI difference	P value
	Mean (SD)	Number	Mean (SD)	Number		
ATS1	8.0 (12.1)	3	4.0 (6.7)	4	-22.2 to 14.2	0.629
ATS2	15.6 (25.9)	76	23.5 (38.0)	96	-17.9 to 2.3	0.122
ATS3	43.8 (46.2)	298	73.6 (85.9)	301	-18.8 to -41.0	<0.001
ATS4	53.7 (48.3)	203	82.0 (74.5)	247	-16.4 to -40.3	<0.001
ATS5	47.6 (42.4)	28	50.6 (43.6)	35	-24.8 to 18.9	0.785

Time seen to disposition for all patients is presented in Table 3. Subgroup analysis of time seen to disposition, according to admission or discharge, demonstrates reduction for ATS category 2 patients who were admitted (95% CI difference 42.6 to 184.9 minutes, $p=0.002$) and ATS category 3 patients who were admitted (95% CI difference 19.1 to 93.7 minutes, $p=0.003$) during the strike period. No difference was observed in time seen to disposition for discharged patients of any ATS score.

Table 3. Time seen to disposition per Australasian Triage Score (ATS) in minutes

Presentations	Strike period		Non-strike period		95% CI difference	P value
	Mean (SD)	Number	Mean (SD)	Number		
ATS1	57.7 (38.5)	3	165.0 (90.9)	4	-253.4 to 38.7	0.229
ATS2	147.9 (129.3)	76	255.1 (246.8)	96	-44.9 to -169.1	0.001
ATS3	119.9 (124.3)	298	165.0 (176.4)	301	-20.7 to -69.7	<0.001
ATS4	85.5 (78.3)	203	99.7 (115.9)	247	-32.9 to 6.6	0.139
ATS5	28.9 (35.6)	28	79.8 (125.9)	35	-1.75 to -100.0	0.043

ED length of stay is presented in Table 4. Length of stay in the ED according to disposition was reduced for ATS category 2 patients who were admitted (95% CI difference 48.3 to 191.5 minutes, $p=0.001$), ATS category 3 patients who were admitted, and discharged (95% CI difference 51.2 to 128.1 minutes, $p<0.001$ and 95% CI difference 12.3 to 63.5 minutes, $p=0.004$ respectively), and ATS category 4 patients who were admitted, and discharged (95% CI difference 15.1 to 102.0 minutes, $p=0.009$ and 12.8 to 48.7 minutes, $p=0.001$ respectively) during the strike period.

Table 4. Emergency Department length of stay per Australasian Triage Score (ATS) in minutes

Presentations	Strike period		Non-strike period		95% CI difference	P value
	Mean (SD)	Number	Mean (SD)	Number		
ATS1	65.7 (42.3)	3	169.0 (90.9)	4	-251.1 to 44.5	0.229
ATS2	162.6 (128.8)	76	278.6 (247.5)	96	-53.5 to -177.9	<0.001
ATS3	161.9 (127.2)	298	238.4 (190.6)	301	-50.5 to -102.5	<0.001
ATS4	134.1 (86.6)	203	179.2 (131.0)	247	-24.1 to -66.2	<0.001
ATS5	74.9 (51.9)	28	126.1 (133.0)	35	-104.5 to 2.1	0.059

No difference was observed in ED mortality (2 patients SP; 1 patient NSP, $p=0.513$), 48-hour mortality (2 patients SP; 4 patients NSP, $p=0.419$), patient walkout (11 patients SP; 17 patients NSP, $p=0.219$), or 30-day unscheduled representations (43 patients SP; 64 patients NSP, $p=0.119$).

Utilisation of commonly ordered laboratory investigations and radiologic imaging modalities are presented in Table 5.

Table 5. Clinical investigations during strike (SP) and non-strike periods (NSP)

Presentations	Strike period		Non-strike period		
	Test/patient	Total (n)	Test/patient	Total (n)	P value
Haematology	0.54	331	0.58	398	0.103
Biochemistry	0.54	326	0.58	395	0.078
Plain film XR	0.45	272	0.48	328	0.237
Ultrasound	0.025	15	0.034	23	0.321
CT	0.066	40	0.060	41	0.710
MRI	0.0016	1	0.0088	6	0.079

Limitations—This study was by design observational and as such suffers from deficiencies inherent with this methodology. Unavoidable errors of the administrative dataset include reliance on electronic patient registration, and data entry by both clerical staff and clinicians to determine key outcome variables. Delays in patient registration or inaccurate clinician reporting of time seen may have contributed to erroneous computer entries. These are more likely to have resulted in significant discrepancies for presentations of high acuity, where initial assessment and patient management take priority over data entry which is often completed retrospectively. Specifically, chart review of ATS category 1 patients revealed doctor attendance on patient arrival (and as such wait time equaling zero minutes) in all cases, yet electronically recorded waiting times are significantly longer. We were unable to ascertain the impact of this systemic error on presentations of other triage categories.

The observational nature of this study dictates that the relative contributions of multiple interacting factors contributing to the observed efficiencies in ED patient processing can be inferred only. Further evaluation of the many factors inherent in patient transit through the ED (patient complexity, number of consultations, waiting times for investigation results, evaluation of response to treatment, time to disposition decision, access block, time of presentation) are required to accurately characterise these.

We attempted to reduce potential confounding secondary to markedly different hospital occupancy, and the adherent efficiencies of scale, by electing the non-strike period during the week immediately following the strike. As such, potential exists for patients to have delayed presentation to the week of the non-strike period in accordance with media and public information directives, thus increasing non-strike period patient numbers and potential acuity. No significant difference was observed however in the number of strike and non-strike presentations. Furthermore the mean

strike and non-strike daily presentations were both lower than the seasonal average of 145 patients daily.

The existence of a “strike culture” with heightened awareness of the requirement for expedient patient processing and disposition by senior clinicians during the strike period, in addition to organisational streamlining in anticipation of expected demand may have contributed to the observed differences in efficiency.

Elective admissions and surgeries were cancelled during the strike period in anticipation of increased demand on available staff. Research and teaching activities were curtailed. Conversely up-regulation and the return to ‘normal’ hospital function in the non-strike period (with the adherent reliance on doctors returning from strike action) may have resulted in inefficiencies not usually present in patient-processing times. We have been unable to quantify the effect of these potential confounders.

Finally this study examines patient processing and measures of activity within the ED only. Whilst the results of this study indicate efficiencies in emergent patient processing, the effect on the organisation as a whole has not been examined. This would require a whole of hospital analysis.

Discussion

ED length of stay is a key measure of ED throughput and a marker of overcrowding. In the present study we have observed reduced ED length of stay to be associated with increased treating clinician seniority during the period of a resident doctors’ strike. This increase in ED efficiency was observed during a period of comparable patient attendance and acuity. Triage during the strike and non-strike periods were via experienced senior nursing staff thus mitigating possible bias in triage categorisation. Similar patient walkout; death within the ED and death within 48 hours; and 30-day non-scheduled readmission rates suggest the observed reductions in ED transit occurred with no decrease in the quality of patient care.

Reduced strike period waiting times are likely resultant on the compounding effect of reduced patient transit times on ED bed occupancy, and subsequent bed availability for newly presenting patients, and the reduction (albeit non statistically significant) in number of patient presentations between the two periods. Additionally, the described ‘strike culture’ may have engendered increased urgency amongst senior clinicians thus prompting efforts to ensure reduced wait times. Notably, however, only ATS category 5 patients from the strike and non-strike periods met advocated performance thresholds for patients seen within recommended waiting times (96% SP and 91% NSP respectively). As such, generalisation of study findings to departments where these performance indicators are routinely met must be interpreted with caution.

A significant reduction in time seen to disposition was observed across a broad range of patient acuity. Reductions in time seen to disposition for patients of moderate to high acuity (ATS category 3 and 2) who were admitted, contributed significantly to the observed efficiencies in ED transit. This suggests disposition decisions were arrived at earlier in the course of patient assessment by senior doctors, with more rapid initiation of the admission process during the strike period.

Such decisions are likely to have been made with greater reliance on clinical acumen than pending investigation results. Additional reduction in time seen to disposition for

admitted patients may have resulted from strategies to improve access to ward beds. The strike period was, however, universally characterised by a reduction in absolute bed availability as compared the non-strike period (Figure 1).

A reduction in the admission rate for ATS category three patients during the strike period was observed. This suggests a subgroup of patients of moderate acuity who may have their discharge from the ED facilitated by more senior clinicians, thus avoiding hospital admission. This may have resulted from earlier institution of appropriate therapy, or the ability of senior clinicians to arrange early outpatient follow-up. Alternatively, the apparent increased admission rate during the non-strike period may be consequent on patients who were erroneously assigned a lower triage category, or patients who have delayed appropriate presentation for the duration of the strike period and thus attended with more fulminant illness during the non-strike period.

Conversely, no significant difference was observed in time seen to disposition for discharged patients of any ATS category. This finding is somewhat counter-intuitive to what would be expected with more experienced clinicians wherein early discharge might be predicted. Several factors in addition to the disposition decision, however, are inherent in the discharge process (input from supportive agencies [social work, physiotherapy], routine nursing tasks, transport arrangements) which are likely to have impacted on time seen to disposition for discharged patients irrespective of study interval. Additionally, increased discharge for patients of ATS category 3 during the strike period suggests patients of moderate acuity who were treated and successfully discharged from the ED by senior clinicians, potentially contributing to these data intervals.

Requests for laboratory and radiologic investigations were similar during the strike and non-strike periods in the present study. Previous investigators have demonstrated reduced investigation ordering by more senior clinicians.^{14,15} The failure of this study to replicate such differences is likely to be secondary to the protocolised initiation of simple haematologic and biochemical blood analysis, in addition to plain film radiography requests, by senior nursing personnel at our institution. This process was unaffected during the strike.

Few previous studies have investigated the effect of treating doctor seniority on the efficiency of emergency care systems. Studies examining the introduction of 'hospitalists' in the North American health system clearly document enhanced efficiency when inpatients are cared for by senior clinicians.¹⁶⁻¹⁸

Salazar et al¹² have similarly reported reductions in patient wait times and increased departmental efficiency during a Spanish junior doctors' strike. That study, however, compared striking departmental operation when staffed with specialist doctors, with a period of usual complement characterised by training doctors in the absence of a recognised emergency medicine faculty. Conversely, the non-strike period of the current study examines a period of normal staff complement with greater than 16 hours daily of specialist Emergency physician supervision in a department staffed by doctors training in emergency medicine and by inpatient specialty trainees.

Travers et al¹⁹ have demonstrated reduction of waiting times and more rapid discharge for walk-in patients triaged by a senior emergency physician as compared standard

nursing triage. Similarly, waiting times improved and a trend toward decreased access block was observed by O'Connor et al with consultant emergency physician presence in a regional referral hospital ED.²⁰

The creation of acute admission units led by consultant physicians has further demonstrated increased efficiencies and earlier patient discharges with senior clinician input early in the course of medical emergencies.²¹ Notably, however, McNamara et al reported that when EDs were left in the hands of senior physicians during the 1975 strike by house officers in New York City, they performed as well as (but not better than) junior doctors.²²

Increasing senior clinician input early in the course of ED presentations may result in similar efficiencies to those observed in this study when effected in emergency care systems more heavily staffed with resident doctors in training. Additionally, results from the present study suggest increased numbers of patients with illness of moderate acuity may have their discharge facilitated by the experience of more senior clinicians.

The potential to reduce ED length of stay and thus overcrowding via accelerating decision-making, and the role of senior clinicians in this process, requires further evaluation.

Conclusion

Significant reductions in ED patient processing times were observed during the period of a resident doctors' strike. This was associated with increased seniority of front-line ED medical staff in addition to departmental and institutional streamlining measures. Strategies to increase senior clinician involvement early in the course of ED presentations may result in similar efficiencies during periods of usual operation.

Competing interests: None.

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