

The impact of medical specialist staffing on emergency department patient flow and satisfaction

M. Christien van der Linden^a, Roeline A.Y. de Beaufort^b, Sven A.G. Meylaerts^c, Crispijn L. van den Brand^a and Naomi van der Linden^d

Objective The aim of this study was to describe the impact of additional medical specialists, non-emergency physicians (non-EPs), performing direct supervision or a combination of direct and indirect supervision at an EP-led emergency department (ED), on patient flow and satisfaction.

Patients and methods An observational, cross-sectional, three-part study was carried out including staff surveys ($n = 379$), a before and after 16-week data collection using data of visits during the peak hours ($n = 5270$), and patient questionnaires during 1 week before the pilot and during week 5 of the pilot. Content analysis and descriptive statistics were used for analyses.

Results The value of being present at the ED was acknowledged by medical specialists in 49% of their surveys and 35% of the EPs' and ED nurses' surveys, especially during busy shifts. Radiologists were most often (67.3%) convinced of their value of being on-site, which was agreed upon by the ED professionals. Perceived improved quality of care, shortening of length of stay, and enhanced peer consultation were mentioned most often. During the pilot period, length of stay of boarded patients decreased from 197 min (interquartile range: 121 min) to 181 min

(interquartile range: 113 min, $P = 0.006$), and patient recommendation scores increased from -15 to $+20$.

Conclusion Although limited by the mix of direct and indirect supervision, our results suggest a positive impact of additional medical specialists during busy shifts. Throughput of admitted patients and patient satisfaction improved during the pilot period. Whether these findings differ between direct supervision and combination of direct and indirect supervision by the medical specialists requires further investigation. *European Journal of Emergency Medicine* 26:47–52 Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.

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^aEmergency Department, ^bProgram Management Acute Care, Haaglanden Medical Center, ^cDepartment of Surgery, Haaglanden Medical Center, The Hague, The Netherlands and ^dCentre for Health Economics Research and Evaluation, University of Technology Sydney, Sydney, Australia

Correspondence to M. Christien van der Linden, PhD, Emergency Department, Haaglanden Medical Center, PO Box 432, 2501 CK The Hague, The Netherlands Tel: +31 703 302 837/+31 650 651 825; fax: +31 703 302 855; e-mail: c.van.der.linden@haaglandenmc.nl

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Introduction

Emergency departments (EDs) worldwide face crowding, delays in patient care, and patient safety issues. ED crowding leads to decreased patient satisfaction and suboptimal patient outcomes [1,2]. To mitigate ED crowding, various interventions have been described [3], including improved staffing [4]. It is generally believed that physicians with more experience can deliver higher quality and more efficient care. However, studies on this subject are not conclusive. Some studies report that senior input in ED patient care improves ED flow [5–7]. A model-based analysis showed that adding one attending physician or senior resident during peak volume shifts decreased ED patients' length of stay (LOS), whereas adding a junior resident prolonged the LOS [8]. In contrast, another study shows that although senior emergency physicians (EPs) use fewer investigations and

are associated with a lower mortality rate, they have longer door-to-order time and door-to-disposition time than nonsenior physicians [9].

To assess the presence of medical specialists in improving patient flow and patient care at an EP-led ED, a pilot project was organized in the Haaglanden Medical Center (HMC) in the Netherlands. Note that in this article, medical specialists are non-EP medical specialists.

During the pilot, medical specialists who would have been 'on-call at their homes' during out-of-hours stayed in the hospital instead, performing direct (on-site present at the ED) or a combination of direct and indirect (on-site present at the ED and part of the evening present in the hospital, available for ED staff) supervision. Residents and EPs kept working as usual. The hypothesis was that during the pilot, improved patient flow and care would be perceived by the residents, EPs, ED nurses, and patients. Also, the association between the presence of medical specialists and patients' LOS and outcomes was investigated.

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Patients and methods

Study design and setting

An observational, cross-sectional study was carried out at an inner-city hospital with 52 000 ED patient visits annually. The 24-bed ED serves as an adult and pediatric teaching hospital and regional trauma center. All incoming patients are registered before they undergo triage using a five-level triage scale [10]. A proportion of the patients are referred to the general practitioner cooperative. The remaining patients are assessed by residents from medical and surgical specialties. Like most Dutch hospitals (over 80% of the 87 EDs) [11], the HMC has recruited EPs alongside these residents. Emergency medicine is a young discipline in the Netherlands: since 2009, medical training in emergency medicine was approved by the Medical Specialist Registration Committee [12]. In HMC, one EP, one or two EPs in training, one surgical resident, one neurology resident, one internal medicine resident, one gynecology resident, and one cardiology resident per shift are dedicated to serving at the ED. Residents and EPs evaluate new arrival patients after nurse-led triage. Medical specialists are available in the hospital (office hours) and on-call at their homes (out-of-hours) when needed.

Intervention

During 8 weeks (3 October 2016 until 27 November 2016), five medical specialists (cardiology, internal medicine, neurology, radiology, and surgery) who would have been on-call during out-of-hours stayed in the hospital instead. They were present during week days between 5 p.m. and 11 p.m. and during the weekends between 2 p.m. and 6 p.m. Primary responsibility for decision making remained with the residents and EPs. During the study, there were no changes in staffing levels other than the additional medical specialists.

Methods and measurements

- (1) A survey (Supplementary Appendix, Supplemental digital content 1, <http://links.lww.com/EJEM/A175>) was distributed through a web-based surveying system, allowing an anonymous response. Surveys were filled in by medical specialists who performed their shift at the ED during the pilot, and by residents, EPs, and ED nurses. The main questions were as follows:
 - (a) During your shift, was your (the medical specialist's) on-site presence of any value for the ED? If yes, please describe this value. If not, why not?
 - (b) During your shift, did you experience delays in patient care processes? If yes, please describe what, in your opinion, were the reasons for these delays.
 EPs and ED nurses were asked to complete an additional survey (Supplementary Appendix,

Supplemental digital content 1, <http://links.lww.com/EJEM/A175>), in which they could indicate the value per medical specialism.

- (2) Patients' LOS (registration to departure) and outcomes were compared between the relevant hours of the pilot period and the same hours during the control period (28 September 2015 to 22 November 2015). Acuity level was categorized into urgent (immediate, high-urgent, and urgent) and nonurgent (standard and nonurgent).
- (3) One week before the pilot and in pilot week 5, independent interviewers gathered information on patients' experiences with waiting time, first contact with their physician, communication and information supply, and patients' satisfaction and recommendation scores using a structured questionnaire (Supplementary Appendix, Supplemental digital content 1, <http://links.lww.com/EJEM/A175>). Satisfaction was scored using a 10-point Likert scale and so was the net promoter score (NPS) [13].

The study was deemed exempt by the regional medical research ethics committee (Southwest Holland, nr. 16-118).

Data analysis

Content analysis [14] was used to identify patterns in the free-text items. With an inductive approach [14], two researchers independently transcribed and analyzed the free-text items using open and axial coding [14]. Their findings were then consolidated together, developing a coding scheme. Interpretations were discussed with a third researcher and themes were determined in agreement. To ensure consistency and coherence, another cycle of coding of all items using the coding scheme was performed. Member checking was performed by summarizing key points and providing the opportunity for participant feedback during project meetings and by e-mail.

Data were analyzed using descriptive statistics, Mann-Whitney U tests, and χ^2 tests where appropriate. Significance threshold was set at a P value of 0.05 or less. The NPS was calculated by subtracting the percentage of detractors (respondents' score: 0–6) from the percentage of promoters (respondents' score: 9–10). It ranges between -100 and $+100$, and a positive score is considered good [13]. The statistical package for the social sciences (IBM Corp., IBM SPSS Statistics for Windows, Version 22.0. Armonk, New York, USA) was used for analyses.

Results

Survey

In total, 379 surveys were completed: 59.6% by medical specialists ($n=226$, response rate: 81%), 27.7% by ED professionals ($n=105$, response rate: 94%), and 12.7% by residents ($n=48$, response rate unknown). During half of

the shifts of the medical specialists (48.7%, $n = 110$), they acknowledged the value of being on-site instead of on-call. The reasons mentioned were improved quality of care, enhanced throughput of patients, and quicker consultations with other medical specialists. Respondents who perceived no value of their on-site presence (48.2%, $n = 109$) most commonly mentioned a lack of crowded conditions during their shift. Among ED professionals, the value of the presence of the medical specialists was confirmed in 35.2% of the cases, denied in 55.2%, and neither confirmed nor denied in 9.5% of the cases.

Compared with other medical specialists, radiologists were most often (67.3%) convinced of their value of being on-site. This perception was shared by the ED professionals: 12 of the 14 (85.7%) EPs and 21 of the 27 (77.7%) ED nurses valued the presence of the radiologist the highest.

Respondents evaluated the pilot as positive in situations when ‘complicated patients’ arrive at the ED: ‘several specialists are involved at the same time early in the process, saving a lot of phone calls and loss of information’ (neurologist). The on-site presence at the ED was also valued because ‘when they (medical specialists, residents, and EPs) work together, less diagnostics are needed’ (ED nurse). This was also expressed by a surgeon, who additionally mentioned another cause for delay: ‘[...] my resident had ordered an ultrasound for a patient with an Achilles tendon rupture [...] I assessed the patient and cancelled the ultrasound [...] clinically the Achilles tendon rupture was obvious [...] I discussed the treatment options with the patient [...] now he’s waiting for cast for 3 h [...] we definitely need more nurses’.

There were also doubts whether the on-site presence of medical specialists would speed up the process: ‘ED throughput is mainly dependent of bed availability, and

nurses’ shortage’ (surgeon), and ‘every patient was assessed by the resident and then again by the medical specialist [...] it takes longer instead of shorter’ (ED nurse). In the latter cases, residents stated that ‘direct supervision improves my education [...] it is really great to have that extra set of eyes’ (resident of neurology).

Figure 1 shows 347 reasons for improved value of on-site medical specialists as indicated by 148 respondents.

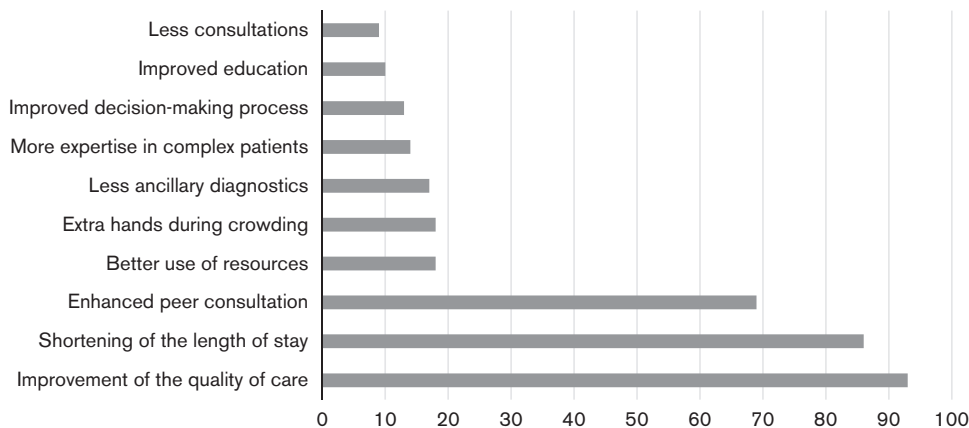
Delays in patient processes were described by 85 of the 226 (37.6%) medical specialists, 71 of the 105 (67.6%) ED professionals, and 29 of the 48 (60.4%) residents. Reasons for delays were waiting times for diagnostics, lack of communication between professionals, and waiting times when more than one specialism was involved. Exit block (getting the patients who need hospital admission to the inpatient floors) was confirmed as a bottleneck. Respondents also mentioned nurses’ shortage and patient transportation from the ED to inpatient floors or radiology. In total, 409 reasons for delays were listed by 194 respondents (Fig. 2).

In open-text fields in 144 surveys, 165 suggestions to improve patient flow and patient care were provided. The most common suggestion for improvement was increasing the number of EPs instead of medical specialists on-site. This was suggested 47 times: nine times by medical specialists, 25 times by EPs, seven times by ED nurses, and six times by residents.

Review of patient visits

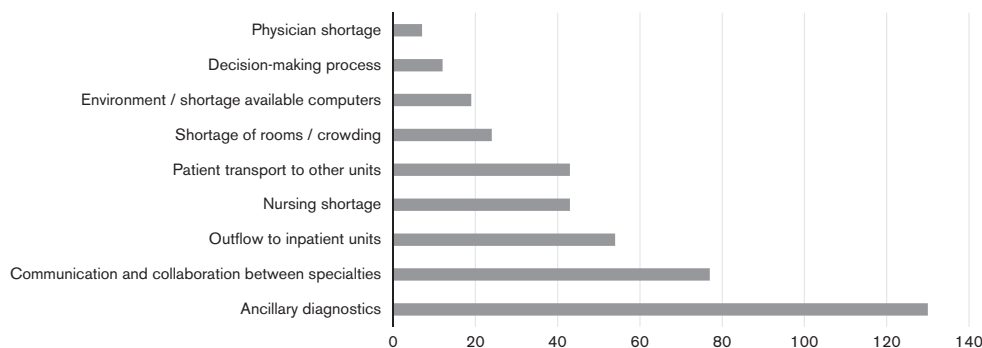
During the pilot, 2598 ED visits were registered versus 2672 during the control period. A higher percentage of the patients were assigned an urgent acuity level during the pilot (60.8 vs. 57.4%, $P = 0.01$), with more patients with headache and head injury (8.4% in the pilot vs. 5.6% in the control period, $P < 0.001$) (Table 1).

Fig. 1



Perceived reasons ($n = 347$) of added value of medical specialists’ presence according to 148 respondents.

Fig. 2



Causes for delay (n = 409) according to 194 respondents.

Table 1 Patient visits during the study period (n = 5270)

Characteristics	Control period (n = 2672)	Pilot period (n = 2598)	Significance ^a
Median age (IQR)	36 (36)	37 (37)	0.56
Age [n (%)] (years)			
≤ 17	483 (18.1)	489 (18.8)	0.49
18–64	1720 (64.4)	1630 (62.7)	0.22
65–74	230 (8.6)	221 (8.5)	0.90
≥ 75	239 (8.9)	258 (9.9)	0.22
Sex: male [n (%)]	1363 (51.0)	1283 (49.4)	0.24
Urgent acuity level [n (%)] ^b	1492 (57.4)	1529 (60.8)	0.01
Medical specialism [n (%)]			
Cardiology	249 (9.3)	246 (9.5)	0.85
Internal medicine	282 (10.6)	274 (10.5)	0.99
Neurology	194 (7.3)	264 (10.2)	<0.001
Surgery	664 (24.9)	577 (22.2)	0.02
Presenting problem [n (%)]			
Abdominal pain	396 (14.8)	385 (14.8)	1.0
Back pain	40 (1.5)	45 (1.7)	0.50
Chest pain and collapse	283 (10.6)	265 (10.2)	0.64
Ear/nose/throat/eye	122 (4.6)	115 (4.4)	0.81
Headache and head injury	150 (5.6)	218 (8.4)	<0.001
Limb problems	572 (21.4)	456 (17.6)	<0.001
Psychiatric disorders	65 (2.4)	65 (2.5)	0.87
Severe trauma and falls	156 (5.8)	136 (5.2)	0.34
Shortness of breath	139 (5.2)	162 (6.2)	0.11
Unwell patient	161 (6.0)	182 (7.0)	0.15
Wounds and local infections	247 (9.2)	224 (8.6)	0.43
Other ^c	270 (10.1)	264 (10.2)	0.95

IQR, interquartile range.

^aP-values were calculated using χ^2 -tests, except for median age, which was calculated using the Mann–Whitney *U*-test.

^bImmediate, high-urgent, and urgent triage level.

^cPresenting problem occurring less than 40 times during the pilot period: allergy, asthma, diabetes, facial problems, irritable child, neck pain, and sexually acquired infections.

Although no differences in LOS of discharged patients were found between the periods, the median LOS of admitted patients was significantly shorter during the pilot (181 vs. 197 min, *P* = 0.006). No differences in dispositions were noted (Table 2).

Table 2 Length of stay and disposition of emergency department patients (n = 5270)

Characteristics	Control period (n = 2672)	Pilot period (n = 2598)	Significance ^a
Median LOS [min (IQR)] ^b	111 (113)	111 (107)	0.13
Median LOS admitted patients [min (IQR)] ^c	197 (121)	181 (113)	0.006
Median LOS discharged patients [min (IQR)] ^d	110 (90)	108 (88)	0.33
LOS [n (%)]			
< 1 h	606 (23.1)	637 (24.8)	0.14
1–2 h	822 (31.3)	766 (29.9)	0.27
2–3 h	572 (21.8)	606 (23.6)	0.11
3–4 h	347 (13.2)	310 (12.1)	0.22
> 4 h	281 (10.7)	247 (9.6)	0.20
Disposition [n (%)]			
Walkouts	31 (1.2)	24 (0.9)	0.40
Admission	549 (20.5)	551 (21.2)	0.55
Discharged home	1470 (55.0)	1360 (52.3)	0.05
Dead	1 (0)	0 (0)	0.32

ED, emergency department; IQR, interquartile range; LOS, length of stay.

^aP-values were calculated using χ^2 tests, except for median LOS, which was calculated using the Mann–Whitney *U*-test.

^bLOS and LOS categories were based on 5194 visits because of missing values in 76 visits.

^cLOS admitted patients: based on 1100 visits.

^dLOS discharged patients: based on 2830 visits.

Patient questionnaires

In total, 166 questionnaires were completed (101 in the week before the pilot, response rate: 29%; and 65 in week 5, response rate: 20%) (Table 3). The NPS increased from –15 in the control week to +20 in the pilot week.

Discussion

This study is the first to examine the effects of the presence of medical specialists on ED patient flow at an EP-led ED. Approximately half of the specialists' shifts were considered of value by themselves for a variety of reasons including improved quality of care, shortening of the LOS, and enhanced peer consultation. When respondents denied any value of their presence, often this was because it was a quiet shift with no need for assistance. Direct supervision resulted in positive and negative

Table 3 Patient satisfaction questionnaires (n = 168)

	Control week (n = 103) [n (%)]	Pilot week 5 (n = 65) [n (%)]
Long waiting time to physicians' contact	30 (29)	13 (20)
Short waiting time to physicians' contact	34 (33)	30 (46)
First contact with physician rated as good	64 (62)	47 (72)
Waiting times need to be improved	41 (40)	12 (19)
Facilities need to be improved ^a	13 (13)	–
Communication and information need to be improved ^b	–	3 (5)
Satisfaction score [median (range)] ^c	8 (1–10)	8 (0–10)
Recommendation score [median (range)] ^d	7 (1–10)	8 (4–10)
Net promoter score ^e	–15	+20

^aFacilities: better chairs in the waiting room, food, and drinks.

^bInformation on discharge instructions

^c10-point Likert scale: 0 (not satisfied at all) to 10 (very satisfied).

^d10-point Likert scale: 0 (not likely at all) to 10 (very likely).

^eNet promoter score: the difference between percentage promoters (individuals who scored 9 and 10) and percentage detractors (individuals who scored 0–6).

perceived effects: for example, ED nurses worried that it increased patients' LOS, whereas residents emphasized that it improved their education.

Supervised learning could lead to inefficient throughput when patients are assessed twice. Only a few studies have assessed the effect of supervision on residency education outcomes; none of them took place at an ED [15]. As balancing patient care and education is challenging at EDs [16,] our potential side effect is an important finding.

Perceived causes for delay mentioned most were in concordance with the literature [17]: waiting time for diagnostics, communication and collaboration with others, and a hampered outflow. Probably, ED staffs' appreciation for the medical specialists' supervision is associated with medical specialists' capability of reducing these perceived delays. For example, the waiting time for the results of these diagnostic procedures (in particular for finalization of the report by the radiologist) is experienced as an important cause for delay. For many ED patients, an radiography, ultrasound, or a computed tomography scan is required during their ED stay. When the radiologist is present at the ED, waiting times are reduced for these patients.

Patient populations were slightly different between both periods, indicating a sicker population during the pilot. For example, there were fewer patients with limb problems and more patients with neurologic complaints, and a higher percentage of patients with an urgent acuity, probably because neurologic care has been lateralized to this hospital. During the pilot, overall LOS remained unchanged but LOS of admitted patients decreased. A reason for this might be that medical specialists were often only present or called when staff were working on a complex patient. They were commonly not involved in treating 'easy' patients.

The perceived decrease in the need for ancillary diagnostics is consistent with a previous study: Salazar *et al.* [6] reported that replacing residents with staff physicians during a resident strike resulted in reduced laboratory

tests and radiographs. In our study, residents were not replaced, but medical specialists were added to the medical formation. A future study is necessary to quantify the effect of adding medical specialists to ED staff on the number of diagnostics (radiology and laboratory studies).

Limitations

As our cross-sectional design precludes causal inference, our findings must be viewed as hypothesis generating, highlighting the value of medical specialists' involvement at peak times. Not all potential confounding factors, such as resource use, workload, direct supervision or the combination of direct and indirect supervision, and ED crowding, were taken into consideration. Also, medical personnel knew that they were under observation, thereby potentially introducing a Hawthorne effect (change in behavior induced by the study itself). For example, EPs may have speeded up the process of admitting patients to show that they can handle the job and do not need medical specialists' presence. The increase in NPS in the patient questionnaires indicates greater patient satisfaction with the services provided. However, this may not solely be caused by the presence of medical specialists and the sample size was small.

The providing of direct supervision versus the combination of direct and indirect supervision by the medical specialists may have led to differences in (perceived) effects on patient' flow and outcomes. The positive effects of the presence of medical specialists might have been more pronounced if they would have provided direct supervision continuously.

Cost-effectiveness was not evaluated in this study. It is possible that the same effect on LOS and satisfaction could be reached in a less costly way (e.g. by making other changes in staffing).

Finally, this pilot involved a single ED, limiting the external validity of the findings.

Despite these methodological concerns, our pilot has offered important suggestions for improvement in ED

patient flow and care. Moreover, it managed to get medical specialists more involved in the ED problems and processes, which created a culture of engagement and situational awareness among non-ED staff. As ED crowding is mainly caused by a hampered outflow for admitted patients, ED LOS mainly depends on the availability of inpatient beds. Improved insights of medical specialists into the outflow problems might improve discharge processes at the inpatient departments. Smooth functioning of the ED is highly dependent on the ability of a hospital to accept admitted patients [18].

The current study shows improved ED patient flow for admitted patients and patient satisfaction, possibly associated with the supervision by medical specialists during peak hours. It is unknown whether it should be medical specialists who perform the supervision; perhaps experienced EPs would have generated the same or even better results. Further research is needed to understand the impact of medical specialists compared with other potential improvements in ED staffing.

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Conflicts of interest

There are no conflicts of interest.

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