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The effect of the employment of experienced physicians in the Emergency Department on quality of care and equality—a quasi-experimental retrospective cohort study

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Background: Increasing acute admissions in Emergency Departments (EDs) negatively affect quality of care, safety and flow. Thus, the Danish Health Authorities recommend the presence of experienced physicians in the ED. In 2016, consultant-led triage and continuous presence of consultants were introduced at a larger ED in Copenhagen, Denmark. This study investigated whether the employment of consultants in a Danish ED affected the quality of care for acutely admitted medical patients in terms of length of admission, readmission and mortality, as well as socioeconomic equality in quality of care delivery. **Methods:** Admission data were collected during two 7-month periods, one prior to and one after the organizational intervention, with 9869 adult medical patients admitted for up to 48 h in the ED. Linear regression and Cox proportional hazards regression analyses adjusted for age, sex, comorbidities, level of education and employment status were applied. **Results:** Following the employment of consultants, an overall 11% increase in index-admissions was observed, and 90% of patients were discharged by a consultant with a reduced mean length of admission by 1.4 h (95% CI: 1.0–1.9). No change was found in in-hospital mortality, readmission or mortality within 90 days after discharge. No change in distribution of quality indicators across patients' socioeconomic status was found. **Conclusions:** Consultants in the ED was found to reduce length of hospitalization without a negative effect on the quality of care for ED-admitted medical patients in general or patients with lower socioeconomic status.

Introduction

The continuous availability of experienced physicians in Emergency Departments (ED) is considered a mean to ensure a safe and sustainable model of care to meet the higher demands and to serve an increasing ageing and multimorbid population.[1]

Internationally, acute admission facilities have been found to positively influence ED patient flow,[2–4] while a lack of experienced physicians in the ED has been found to contribute to a poor quality of care.[5] The presence of experienced physician specialists in the ED compared to other models of ED-staffing is likely to reduce length of hospitalization (length of stay, LOS) but the evidence shows inconsistent results,[4,6–12] and comparisons are further complicated by local and national differences in the healthcare systems.[13,14]

Low socioeconomic status (SES) has been found to be strongly associated with additional hospitalizations,[15] readmissions and mortality,[16] but not with LOS.[17] Yet, when health services are free-of-charge, there is limited evidence of social inequality in ED quality of care for patients with a similar disease.[18]

To fulfil the recommendations on the EDs' organization from the Danish Health Authority, which involves continuous availability of physician specialists,[19] a larger ED at one of the Copenhagen University Hospitals in Denmark implemented a new organizational model of acute care in 2016 comprising the employment of Acute Medical Consultants (AMCs) in the ED (table 1). Before the organizational intervention, the ED was staffed with ED nurses as well as trainee doctors and experienced physicians from the specialized wards. The physicians did daily rounds in the ED in addition to tasks in the specialized outpatient clinics and inpatient wards. After the intervention, the ED was staffed with trainee doctors and AMCs dedicated to ED patients from 9 am to 9 pm all week. The AMCs were responsible for the ED triage based on the National Early Warning Score,[20] as well as investigation, treatment and discharge of all admitted medical patients in the ED bed-section, with the exception of patients with symptoms of an infectious disease. In those cases, a specialist from the Department of Infectious Diseases would approve the treatment plan before discharge from the ED due to a management decision. In addition to the introduction of AMCs, a guideline requiring a limit of 4 h from admission to the presence of a treatment plan was introduced.

To our knowledge, only sparse evidence on the effect of the presence of AMCs, or their equivalent in the ED, on the quality of care exist, and the effect of AMCs on the socioeconomic equality in the quality of care for acutely admitted medical patients has not yet been investigated. Thus, the aim of this study was to investigate if the employment of AMCs in a Danish ED affected the safety and quality of care in terms of LOS, readmission, in-hospital mortality and mortality up to 90 days after discharge, as well as affected socioeconomic equality in quality of care delivery.

We hypothesized that AMCs in the ED would apply a more holistic view on the admitted patients and would consider the patients' potential additional medical conditions in the management plan compared with trainee physicians on ED duty. This would imply reduction in acute readmissions, with the strongest impact on patients with lower SES, due to comorbidities being strongly associated with low SES.[21]

Methods

Study design

The study used a retrospective, registry-based, quasi-experimental design comparing two open cohorts of patients acutely admitted to the 29-bed ED in greater Copenhagen in two 7-month periods. A control cohort before the organizational intervention at the ED (1 August 2015–28 February 2016) and an intervention cohort after the organizational intervention (1 August 2016 i.e. first day of the intervention to 28 February 2017). Data collection ended prior to the implementation of a new electronic patient record system in March 2017. To account for seasonal deviation in disease patterns, the control cohort was collected at the same time 1 year earlier.

Study population

Patient data in this study were based on data from a larger study, where ED patients were identified by having an ED admission blood sample analyzed, which is mandatory for all ED patients. For this study, adult patients were included if they were admitted acutely to the ED during any of the study periods. Patients with a LOS >48 h were excluded, as 48 h is the criteria for eligibility for admission to the ED bed-section. The index admission was defined as the first admission in the inclusion period. Patients were followed until acute readmission or death, whichever occurred first, with administrative censoring taking place at 90 days from discharge, or at the end of the cohort follow-up. Hospital readmission was defined as an acute, unplanned admission more than 4 h after discharge.

Setting

The ED is part of the Danish publicly funded largely free-of-charge healthcare system, and serves all acute medical patients referred to the hospital by General Practitioners (GPs), the emergency medical helpline, out-of-hours service, or ambulances—with the exception of paediatric, gastroenterological and obstetric patients, who are admitted to other specialized EDs at the hospital. Patients in need of surgery are admitted directly to the surgical department. The average daily ED patient admission intake was 30–45 patients with hospitalization of up to 48 h. The ED serves a catchment area of 517 000 people, of whom a larger number is socioeconomically disadvantaged compared with national figures.[22]

Data collection

ED patients were identified by their unique personal identification numbers via the hospital's Clinical Biochemistry database, and individual-level register data were made available as pseudonymized data in an encrypted database by Statistics Denmark. Data on diagnoses, admissions, and readmissions were obtained from the Danish National Patient Registry (NPR), while data on mortality were obtained from the Danish Civil Registration System. Data on SES were obtained from Statistics Denmark[23,24] and assessed by highest attained level of education and employment status, each divided into three categories: short, middle or long education, as well as employed, unemployed or outside the labour market, respectively.

To identify comorbidity burden, the Charlson comorbidity index (Charlson score) was calculated for each patient using all diagnoses registered in the NPR from the preceding 10 years.[25–27] The Charlson score was calculated with a SAS macro,[28] with updated weights as defined by Quan et al.[25]

Outcomes

Outcomes included length of ED hospitalization, acute readmissions, in-hospital mortality (within the first 48 h while admitted to the ED) and mortality after discharge.

Readmissions and mortality were reported at four time points after discharge: at 72 h and 7 days to reflect the quality of care of the hospitalization and discharge process, and at 30 and 90 days to reflect the possible effect of AMCs with regard to chronic disease management.

Statistical analysis

Comparisons were performed using a Welch two-sample t-test or, for non-normally distributed data, a Wilcoxon rank sum test. Categorical variables are presented as frequency with percentage, and comparisons were performed using the chi-square or Fisher's exact tests.

Table 1 Significant changes in the ED at a Copenhagen University Hospital, Denmark before and after the organizational intervention including employment of AMCs from 1 August 2016

Before the organizational intervention	After the organizational intervention
Medial staff employed at the ED	
ED nurses	ED nurses 5 Acute Medical Consultants[a]
Treatment responsibility	
The specialized wards	The Flowmaster (an Acute Medical Consultant) at the ED. For patients with an infectious medical disease diagnosis, the treatment responsibility is placed on the Department of Infectious Diseases
Patient assessment	
The Trainee doctors from specialized wards on duty at the ED	The Acute Medical Consultants employed at the ED
Triage and treatment	
Weekdays from 9 am to 6 pm: 4 Trainee doctors from specialized wards on duty at the ED Visiting specialist consultants from the specialized medical wards doing daily rounds From 6 pm to 9 am and during weekends, specialist advice was only available from the cardiology and infectious disease specialties Call for advice from geriatric and internal medicine (respiratory, endocrinology, cardiology and infectious diseases) specialist was available from 9 am to 6 pm on weekdays	Every day from 9 am to 9 pm: 5 Trainee doctors 2 Acute Medical Consultants 1 Flowmaster (AMC responsible for clinical logistics and coordination with other departments) From 9 pm to 9 am: Trainee doctors from specialized wards with presence of one medical specialists from specialized wards performing same tasks as the Acute Medical Consultants
Availability of treatment plan	
Confirmed by visiting physician specialists from the specialty wards, who performed one daily patient round after the morning conference or during the day upon request	No later than four hours after receiving the patient Infectious medical diseases diagnoses: At ward round morning and afternoon by the consultants from the Department of Infectious Diseases
Equipment and analysis	
Access to x-ray, operation facilities and quick laboratory test results	Same as before and furthermore purchase of ultrasound scanner operated by Acute Medical Consultants at the ED

a: The medical specialty of Emergency Medicine has only been present in Denmark since February 2018, i.e. after the study period, therefore, the AMCs were consultants specialized in thoracic surgery, internal medicine, nephrology or cardiology, supplemented with a 2-year Danish postgraduate degree in Emergency Medicine.

Models were fitted for all patients and stratified to patients with infectious and non-infectious diagnoses to avoid the introduction of bias related to potential longer waiting times for patients diagnosed with infectious diseases.

Comparison of LOS before and after the organizational intervention was done by multivariable linear regression models. As the distribution of LOS did not normalize after logarithmic transformation, generalized least squares were used for inference in the linear model, with observations weighted according to their estimated variance. Different variance functions were used, and model selection was based upon minimizing the Akaike information criterion (AIC). The model for 'All Patients' had the lowest AIC when using an exponential variance function for weights, and the models for 'Infectious or Non-infectious Diagnoses' both had lowest AIC when using a power variance function.

Cumulative incidences of readmission before and after the organizational intervention were determined using the Aalen–Johansen estimator,[29] treating death as a competing risk and compared utilizing Gray's test.[30] Due to a crossing of the cumulative incidence curves, analyses were repeated for days 0–21 and 21–90, separately.

Differences in readmission and mortality within 90 days between before and after the organizational intervention were done using cause-specific Cox proportional hazards regression, treating death as a censoring event for readmission. The assumptions of proportional hazards and linearity for quantitative variables in the Cox model were assessed using cumulative sums of martingale residuals.[31]

Association between the in-hospital mortality and the organizational intervention was analyzed with multivariable logistic regression models.

All analyses were adjusted for age, sex, educational level, employment status and Charlson score.

In the analysis of the effect of the organizational intervention on the social equality in quality of care, SES was included as a categorical variable.

A P-value <0.05 was considered statistically significant. All analyses were performed using SAS 9.3 or R version 3.2.3.

Ethics approval

The study was approved by the Danish Health and Medicines Authority: Amendment to approval 3-3013-1061/1, Danish Data Protection Agency: HVH-2014-018 (I-Suite nr: 02767) and The Danish Patient Safety Authority (FSEID-00002943). According to Danish law, approval from the National Committee on Health Research Ethics or patient consent was not needed since only registry data were used.

Results

A total of 7071 and 7655 patients were admitted to the ED during the control and intervention period, respectively. We excluded 2327 (33%) and 2341 (31%) patients in the two cohorts due to LOS >48 h as these patients were referred to in-hospital specialty departments, as well as 97 (1%) and 92 (1%) patients due to age <18 years. Furthermore, 218 (5%) and 254 (5%) patients in the two patient cohorts had missing data on education and/or employment status and were excluded in the regression analysis. All patients had complete follow-up information.

Patient characteristics

The final samples consisted of 4647 and 5222 patients prior to and after the organizational intervention, respectively, showing an 11%

Table 2 Socioeconomic and clinical characteristics of acutely admitted medical patients in the ED bed-section at a Copenhagen University Hospital, Denmark within two 7-month periods: one prior to and one after the organizational intervention and the employment of AMCs in the ED, $n = 9869$

	Before the organisational intervention	After the organisational intervention	*P*
Index-admissions in the ED, *n (%)*	4,647 (47.1)	5,222 (52.9)	<.001
Other diagnose than infection[a]	4,240 (91.2)	4,699 (90.0)	0.03
Diagnosed with infectious diseases[b]	407 (8.8)	523 (10.0)	
Sex, *n* (%)			0.51
Male	2,201 (47.4)	2,508 (48.0)	
Female	2,446 (52.7)	2,714 (52.0)	
Age (years), *n* (%)			0.61
18-24	358 (7.7)	447 (8.6)	
25-34	587 (12.6)	638 (12.2)	
35-44	612 (13.1)	665 (12.7)	
45-54	769 (16.6)	823 (15.8)	
55-64	702 (15.1)	811 (15.5)	
65-79	1,059 (22.8)	1,187 (22.7)	
80+	560 (12.1)	651 (12.5)	
Age (years), median (IQR)	55.0 (38.5-71.0)	55.4 (38.5-71.7)	0.60*
Employment status, *n* (%)	4,464 (96.1)	5,013 (96.0)	0.12
Employed	1,513 (33.9)	1,798 (35.9)	
Unemployed	71 (1.6)	72 (1.4)	
Outside the labour market	2,880 (64.5)	3,143 (62.7)	
Highest educational level, *n* (%)	4,606 (99.1)	5,168 (99.0)	0.39
Short	2,222 (48.2)	2,515 (48.7)	
Middle	1,675 (36.4)	1,819 (35.2)	
Long	709 (15.4)	834 (16.1)	
Charlson Comorbidity Index, *n* (%)	4,647 (100)	5,222 (100)	0.31
0	2,900 (62.4)	3,268 (62.6)	
1	642 (13.8)	740 (14.2)	
2	599 (12.9)	614 (11.7)	
3+	506 (10.9)	600 (11.5)	
Charlson Comorbidity Index, mean (IQR)	0 (0-1)	0 (0-1)	0.90[1]

a: Before the intervention: treated and discharged by a physician specialist from a specialized ward. After the intervention: treated and discharged by an Acute Medical Consultant (an experienced physician specialist qualified in Emergency Medicine).

b: Before and after the intervention: treated and discharged by a physician specialist from the Department of Infectious Diseases.

*: Difference is assessed using Wilcoxon rank sum test[1]

IQR: Interquartile range

increase in index-admissions (table 2). After the organizational intervention, a small decrease was seen in the proportion of patients admitted with diagnoses other than infectious disease, thus treated and discharged by AMCs (90.0% vs. 91.2%, *P* 0.03). There were no significant differences between the two cohorts regarding distribution of sex, age, Charlson score and SES.

Length of hospitalization

After the organizational intervention, the LOS for admitted patients was reduced from 13.2 to 12.0 h, $P < 0.001$ (table 3). The adjusted analysis showed a similar reduction of 1.3 h, $P < 0.001$ (95% CI: 0.8–1.7) (table 4). When stratifying the patients by diagnosis, patients with non-infectious disease had a significantly reduced LOS by 1.4 h, $P < 0.001$ (95% CI: 1.0–1.9), while no change in the LOS for patients diagnosed with infectious disease was observed.

Readmission

Approximately 25% of all patients were readmitted within 90 days of discharge in both cohorts (table 3). No significant differences were found between the cumulative incidences of readmission (Supplementary figure S1).

In-hospital mortality

Patients who died during hospitalization did not differ between the cohorts, at 1.4% and 1.6% before and after the organizational intervention, respectively (table 3). When adjusted for age, sex, educational level, employment status and Charlson score the result was confirmed (table 4). A decrease in the in-hospital mortality was observed for patients with infectious disease (4.2% vs. 1.9%, *P* 0.04) in the period following the organizational intervention (table 3).

90-day mortality

Approximately 1% of all patients died during the first 90 days of discharge (table 3). No differences were found between the cumulative incidences of mortality following discharge (Supplementary figure S1). Multivariable analysis revealed no significant difference between the cohorts (table 4).

Effect on the social equality of the quality of care

Admission of patients across educational levels and employment status to the ED was similar before and after the organizational intervention (table 2), which would indicate that any socioeconomically patterned access to treatment at the ED was not affected by the organizational intervention.

We found no socioeconomically patterned distribution of LOS, in-hospital mortality or distribution of readmission and mortality up to 90 days following discharge in both the control and intervention cohort and the adjusted multivariable analyses confirmed this.

Discussion

The findings from this study suggest that AMC-led triage, treatment and discharge together with the introduction of a limit of 4 h from admission to the presence of treatment plans were associated with 1.4 h shorter LOS, but not with in-hospital mortality, readmission or

Table 3 Univariable analysis of quality and safety indicators of acutely admitted medical patients in the ED bed-section at a Copenhagen University Hospital, Denmark within two 7-month periods: one prior to and one after the employment of AMCs in the ED, $n = 9869$

		Before the organisational intervention	After the organisational intervention	*P*
Admitted ED patients, *n*		4,647	5,222	
In-hospital mortality, *n* (%)				
All patients		63 (1.4)	81 (1.6)	0.42
Other diagnose than infection[a]		46 (1.1)	71 (1.5)	0.08
Diagnosed with infectious diseases[b]		17 (4.2)	10 (1.9)	0.04
Discharged ED patients, *n*		4,582	5,138	
Length of stay, hours, *Mean (Median, IQR)*				
All patients		13.2 (9.2, 4.5-19.7)	12.0 (7.8, 3.6-17.5)	<.001*
Other diagnose than infection[a]		13.0 (9.0, 4.5-19.3)	11.6 (7.6, 3.5-17.0)	<.001*
Diagnosed with infectious disease[b]		15.4 (11.2, 4.2-22.4)	15.0 (11.2, 4.5-21.9)	0.72*
Events during follow-up, *n*		4,584	5,141	
Readmission, 90 days follow-up, n (cumulative incidence competing risk, %)[c]				0.30
72 hours	Pt. other disease	205 (4.9)	210 (4.6)	
	Pt. infectious disease	17 (4.4)	38 (7.4)	
7 days	Pt. other disease	305 (7.3)	334 (7.3)	
	Pt. infectious disease	23 (5.9)	48 (9.4)	
30 days	Pt. other disease	617 (15.3)	644 (14.5)	
	Pt. infectious disease	61 (17.0)	73 (14.8)	
90 days	Pt. other disease	937 (25.4)	984 (24.5)	
	Pt. infectious disease	77 (23.5)	96 (21.7)	
Mortality, 90 days follow-up, n (cumulative incidence competing risk, %)[c]				0.12
72 hours	Pt. other disease	5 (0.1)	4 (0.1)	
	Pt. infectious disease	0 (0.0)	2 (0.4)	
7 days	Pt. other disease	14 (0.3)	9 (0.2)	
	Pt. infectious disease	2 (0.8)	2 (0.8)	
30 days	Pt. other disease	30 (0.7)	24 (0.5)	
	Pt. infectious disease	3 (0.8)	6 (1.2)	
90 days	Pt. other disease	47 (1.3)	36 (0.9)	
	Pt. infectious disease	5 (1.6)	6 (1.2)	

a: Before the intervention: treated and discharged by a physician specialist from a specialized ward. After the intervention: treated and discharged by an Acute Medical Consultant (experienced physician specialist qualified in Emergency Medicine).
b: Before and after the intervention: treated and discharged by a physician specialist from the Department of Infectious Diseases.
c: Cumulative incidence was determined using the AalenJohansen estimator treating death as a competing risk.
*: Difference is assessed using Wilcoxon rank sum test.
IQR, interquartile range.

mortality within 90 days from discharge, when compared with the ED organization staffed with nurses and trainee physicians. We did not find any association between SES in patients and the above-mentioned outcomes. These findings indicate that the continuous presence of consultants in the ED may reduce length of admission and ensure efficient handling of an increasing ED intake without compromising quality and safety across SES in terms of mortality and readmission. In contrast to our hypotheses, we did not detect a larger effect of reduction in acute readmissions on patients with lower SES after the organizational intervention. Whether the AMCs actually employ a more holistic approach in the treatment and management plans of the ED patients compared with trainee doctors or not cannot be concluded from this study as we utilize rather crude measurements of outcomes.

Strengths and limitations

Strengths include the use of retrospective national individual-level registry data, no loss to follow-up and the real-life setting. The credibility of the NPR registry for coding the Charlson score has shown a positive predictive value of 98%,[26] however, registration do not include comorbidities treated by GPs, and hospital registration of underlying diagnoses might not be registered on every admission. Limitations include the use of biochemistry data to identify admitted ED patients, thus, we may have missed patients with very short ED stays with discharge before the ED blood sample was taken. This problem should, however, be equally present in both control and intervention cohorts. Another limitation is the use of diagnoses as a proxy for discharge by AMCs or physician specialist from the Department of Infectious Diseases. The short study period could be a limitation, as healthcare system reorganization of this scale normally requires a longer implementation period to show an effect on the quality of care. The interpretation of reduced LOS is limited since we cannot identify the reduction attributed to a specific part of the ED stay or time limit of treatment plans, as the time waiting cannot be separated from the time receiving medical care. The findings of reduced LOS could potentially be larger since we studied the overall reduction similar to the AMCs working 24/7 and did not account for the lack of AMCs from 9 pm to 9 am, which is a methodological weakness. Notably, our study only investigated the potential of social inequality in outcomes as a gradient across three levels of SES and did not assess inequality for subgroups, e.g. homeless patients, drug users, or immigrants, or outcomes associated with equal needs (e.g. whether patients were referred from GP or emergency call), since data were not available. Finally, the chosen quality and safety measures are only proxy measures associated with the organizational, clinical and patient experienced quality and safety.

Comparisons with international literature

Reduced LOS following the presence of experienced physician specialists in EDs has also been found in studies from the UK and Qatar,[7,9,11] but with non-significant findings in studies from UK and Australia.[4,12] A study from Taiwan found that ED physician specialists was associated with increased LOS compared to less

Table 4 Multivariable regression models: Quality of Care and Safety Outcomes for acute admitted medical patients in the ED bed-section at a Copenhagen University Hospital, Denmark within two 7-month periods: one prior to and one after the employment of AMCs in the ED, adjusted for age, sex, Charlson comorbidity index, education level and employment status, $n = 9392$

Length of stay, hours, linear regression model[a]	Estimate	95% CI	P	R^2
After the organisational intervention vs. before				
All patients	-1.3	-1.7 to -0.8	<.001	0.065
Patients with other diagnose than infection[b]	-1.4	-1.9 to -1.0	<.001	0.067
Patients diagnosed with infectious diseases[c]	-0.11	-1.8 to 1.6	0.89	0.079
Readmission up to 90 days, proportional hazards regression model	HR			
After the organisational intervention vs. before				
All patients	0.96	0.9-1.0	0.31	
Patients with other diagnose than infection[b]	0.96	0.9-1.1	0.44	
Patients diagnosed with infectious diseases[c]	0.91	0.7-1.2	0.53	
In-hospital mortality, logistic regression model	OR			
After the organisational intervention vs. before				
All patients	1.05	0.7-1.5	0.80	
Patients with other diagnose than infection[b]	1.28	0.9-1.9	0.21	
Patients diagnosed with infectious diseases[c]	0.42	0.2-1.0	0.05	
Mortality up to 90 days, proportional hazards regression model	HR			
After the organisational intervention vs. before				
All patients	0.97	0.8-1.2	0.81	
Patients with other diagnose than infection[b]	0.94	0.7-1.2	0.64	
Patients diagnosed with infectious diseases[c]	1.34	0.4-4.0	0.60	

a: Variance function chosen by the Akaike information criterion (AIC): all patients, variance exponential function; other disease than infection, variance power function; infectious disease, variance power function.

b: Before the intervention: treated and discharged by a physician specialist from a specialized ward. After the intervention: treated and discharged by an Acute Medical Consultant (experienced physician specialist qualified in Emergency Medicine).

c: Before and after the intervention: treated and discharged by a physician specialist from the Department of Infectious Diseases.

experienced ED physicians[10] as physician specialists took more time to order prescriptions and patient disposition. A Danish study found increased ED LOS following employment of physician specialists,[8] but this may be due to the opening of an ED short-stay unit and not the employment of experienced physicians. However, most studies compare the outcome as a consequence of the advice from or the presence of an experienced physician vs. the lack of advice/presence. Only four studies compare one model of ED senior-led medical service to another;[4,6–8] of these, only one adjusted for confounding and did not find an association between mean LOS and physician specialist availability[6] in contrast to our findings. This difference may be due to the study population consisting of all acutely admitted patients and not exclusively ED-admitted patients. The introduction of AMCs entailed time-managed patient flow, which may have contributed to the briefer hospital stay. We cannot conclude whether the achieved effectiveness is due to the AMCs' professionalism, the time-framed treatment, or shortening of stay for logistic reasons due to patient increase. However, the trends towards effective hospital stays with shorter LOS[32] align with our results. Patients with an infectious disease did not have a shorter LOS after the employment of AMCs. These patients often require IV-antibiotics and are therefore admitted longer and additionally according to local practise they had to wait for discharge from a specialist from the Department of Infectious Disease.

Readmissions apply additional pressure to the healthcare system by increasing the patient volume.[33] Our study confirmed the previous findings of no effect of consultant-led ED services on readmission rates.[7,8,10] These findings are in contrast to a British study comparing an ED staffed only with trainee physicians and an ED staffed with trainee physicians and experienced physician specialists, which reported that the decrease in readmission was related to the use of physician specialists.[6] Since our study compares two models of ED experienced specialist staffing, this could explain the difference in results.

In-hospital mortality or death shortly after discharge can indicate poor quality of care.[34] The unaffected mortality rates during and after hospital stay in our study are similar to the findings from the UK[7] and Denmark.[35] An Australian study found an increase in in-hospital mortality when comparing consultant-led triage and consultant-led triage in combination with an acute medical assessment unit, but this study displayed only unadjusted analyses and had a very small sample size,[4] while a British and a Taiwanese study found lower in-hospital mortality rates when using experienced physician specialists in the ED.[6,10] All other clinical confounders being equal, our results indicate that the quality of acute care assessed by mortality does not differ significantly between physician specialists from the specialty wards and AMCs. Yet, the reduced mortality rate for patients with infectious disease in our study points to that these patients may benefit from treatment led by AMCs.

Although increase in ED presentations could result in poorer ED flow and quality of care, this study observed an increase in all ED index-admissions of 11%, reduced LOS without a lowering in the quality of care in relation to mortality or readmissions. The increase in patient intake might be a result of change in referral pattern due to shorter ED waiting time in this ED compared to other EDs in Copenhagen. Since a similar case-mix of patients before and after the intervention was observed, we expect that the retention of the quality despite reduction in LOS could be related to the employment of the AMCs.

Our findings of equal effect on the clinical outcomes across SES before and after the organizational intervention indicate that the intervention had no socioeconomic effect on the quality of care indicators and that poorer quality and safety outcome seems to be related to morbidity and not SES or ED-staffing. Further, it seems that social equality in quality and safety indicators is possible despite overrepresentation of ED-admitted patients with a lower SES. Our findings contradicts previous findings from Ireland, which found a social gradient in in-hospital mortality[17,36] and 30-day mortality.[36] The SES in the Irish studies was based on the patients' residential area and the study population was comprised of all acutely admitted patients, while the data in our study was based on individual SES measures and the study population was less severely ill, as our study population had a hospital stay of up to 48 h in the ED.

Low LOS is essential to obtain flow and avoid crowding. A reduction of 1.4 h is highly clinical relevant and the saved yearly bed-hours are equivalent to 1044 patients. These findings may not be limited to the Danish healthcare system as frontloading in terms of early clinical senior decision capacity will be applicable to all EDs with a flow-culture and a high throughput of patients and a part of the solution to increased patient intake. The findings may inform healthcare planners and hospital boards in their attempt to configurate efficient models of care without compromising quality, safety and equality in access and treatment in their choice of organizational designs.

Conclusion

The employment of AMCs at the ED was associated with increase in admissions and reduced LOS without affecting in-hospital mortality, readmission or mortality within 90 days after discharge. The distribution of the quality of care indicators across patients' SES remained similar prior to and after the ED organizational intervention, which together with the considerate overrepresentation of ED patients with a lower SES, may indicate a continuous focus on social equality in the quality of care delivery at this ED.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Availability of data and material

The data that support the findings of this study are available from Statistics Denmark but restrictions apply to the availability of these data, which were used under licence for the current study, and therefore they are not publicly available.

Key points

- Consultants in the ED may reduce length of admission without a negative effect on the quality of care.
- Consultants in the ED may handle increasing ED intake without compromising quality and safety.
- Poorer quality and safety outcome seems to be related to morbidity and not SES in ED-admitted patients.
- Social equality in quality and safety indicators is possible despite overrepresentation of ED-admitted patients with a lower SES.

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Gender aspects in cardiooncology

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Background: Cardiooncology is a relatively new subspeciality, investigating the side effects of cytoreductive therapies on the cardiovascular (CV) system. Gender differences are well known in oncological and CV diseases, but are less elucidated in cardiooncological collectives. **Methods:** Five hundred and fifty-one patients (278 male, 273 female) with diagnosed cancer who underwent regular cardiological surveillance were enrolled in the '**MA**nnheim **R**egistry for **C**ardio**O**ncology' and followed over a median of 41 (95% confidence interval: 40–43) months. **Results:** Female patients were younger at the time of first cancer diagnosis [median 60 (range 50–70) vs. 66 (55–75), $P = 0.0004$], while the most common tumour was breast cancer (49.8%). Hyperlipidaemia was more often present in female patients (37% vs. 25%, $P = 0.001$). Male patients had a higher cancer susceptibility than female patients. They suffered more often from hypertension (51% vs. 67%, $P = 0.0002$) or diabetes (14% vs. 21%, $P = 0.02$) and revealed more often vitamin D deficiency [(U/l) median 26.0 (range 17–38) vs. 16 (9–25), $P = 0.002$] and anaemia [(g/dl) median 11.8 (range 10.4–12.9) vs. 11.7 (9.6–13.6), $P = 0.51$]. During follow-up, 140 patients died (male 77, female 63; $P = 0.21$). An increased mortality rate was observed in male patients (11.4% vs. 14%, $P = 0.89$), with even higher mortality rates of up to 18.9% vs. 7.7% ($P = 0.02$) considering tumours that can affect both sexes compared. **Conclusions:** Although female patients were younger at the time of first cancer diagnosis, male patients had both higher cancer susceptibility and an increased mortality risk. Concomitant CV diseases were more common in male patients.

Introduction

Cardiovascular (CV) diseases and cancer are the most frequent mortality causes in the western world.[1] There is a growing evidence suggesting shared underlying biological mechanisms.[2] CV diseases and cancer share common risk factors, such as age, gender, metabolic syndrome and nicotine consumption.[3] Some of these risk factors can be positively influenced by preventive measures, while others are predetermined. Some diseases can present completely different in both sexes with regard to prevalence, symptoms, disease progression and prognosis.[4] Although attempts have been made to address gender-related differences in current guidelines, general awareness is still lacking.[5] In cardiac diseases, different clinical symptoms may be misinterpreted affecting diagnosis and treatment strategy.[6] Gender differences play also a role in oncology. Some tumour types are caused by hormonal influences, which is why certain tumours are more likely to occur in women or men. Different distributions are already apparent in childhood, which shows that gender differences and cancer susceptibility are closely related.[7] There is only sparse data on gender differences in cardiooncology so far. Even though cancer statistics indicate that men are more prone to get cancer,[7,8] women seem to be more susceptible to cardiotoxic side effects of chemo- or radiotherapy.[9,10] However, the influence of concomitant CV diseases or risk factors in