

# Referral of paediatric patients follows geographic borders of administrative units

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## ABSTRACT

**INTRODUCTION:** This observational study examines changes in paediatric hospital-seeking behaviour at Kolding Hospital in The Region of Southern Denmark (RSD) following a major change in administrative units in Denmark on 1 January 2007.

**MATERIAL AND METHODS:** Data on the paediatric admissions from 2004 to 2009 reported by department of paediatrics and municipalities were drawn from the Danish National Hospital Registration. Patient hospital-seeking behaviour was related to changes in the political/administrative units. Changes in number of admissions were compared with distances to the corresponding departments.

**RESULTS:** From 2006 to 2009, the number of acute and planned admissions at the Department of Paediatrics in Kolding for children living in the RSD increased by 46.1% and 65.0%, respectively. The corresponding changes for children living in the neighboring region, the Central Denmark Region, were -69.9% and -78.6%.

**CONCLUSION:** The geographical location of the department under study and the changes in administrative units created a "natural experiment" that showed major changes in paediatric hospital-seeking behaviour. Within the RSD, the free choice of hospitals seemed to work, whereas the new boundary between The Central Denmark Region (CDR) and the RSD meant that paediatric patients were admitted at hospitals situated in the CDR even though the distances to these hospitals were considerably longer than those to other hospitals. One could question whether patients really have a free choice across administrative borders as political and economic concerns seemed to outweigh free patient choice.

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Treatment at public Danish hospitals is free of charge and the patients are entitled to choose the hospital (at the same level of specialization) at which they wish to be treated [1]. A comparative study of the three Scandinavian countries found that only few patients had actually chosen their hospital themselves despite of the fact that only few formal, legislative and economic barriers exist [2]. Previous studies indicate that distance is an important factor determining patients' choice of hospital [3-6]. However, other factors may be at play, e.g.

effect of economic incentives rooted in local government's interest in maximizing the number of patients from their own county/region who are treated at the county/region's hospitals in order not to have to pay the higher price at hospitals in other regions or in the private sector. Treatment at another administrative unit is usually settled with 100% of the diagnosis-related group (DRG) value, which is not the case for treatment performed at hospitals within the same administrative unit.

On 1 January 2007, the 13 Danish counties were merged into five regions. The public hospitals hereby became organized in bigger administrative units, each with more hospitals than in the previous counties [7]. If the political paradigm holds true that patients are capable of evaluating the quality of the health services and are aware of their right to select the hospital at which they wish to be treated [8], one would expect no change in patients' hospital-seeking behaviour following the change in administrative borders.

The Department of Paediatrics at Kolding Hospital is situated near the old borders of the three counties of Sønderjylland, Ribe and Fyn, which were merged with the southern part of Vejle County to form The Region of Southern Denmark (RSD). Moreover, the Department lies just south of the border between the new regions RSD and The Central Denmark Region (CDR) (**Figure 1**). Approximately 30% of the population traditionally served by the Department lived in the northern part of the County of Vejle, i.e. within the municipalities of Horsens and Hedensted, which became a part of the CDR. Furthermore, the former municipality of Christiansfeld, previously situated in the County of Sønderjylland, became a part of Kolding municipality, which belonged to the County of Vejle (**Figure 1**, **Figure 2**). This geographical location combined with the change in administrative units created a "natural experiment" in which a possible influence of economic/political priorities on paediatric hospital-seeking behaviour could be studied in an observational study [9].

## MATERIAL AND METHODS

The study was performed in the RSD at the Department of Paediatrics at Kolding Hospital.

Before 2007 each of the four counties combined to

## ORIGINAL ARTICLE

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form the RSD had one department of paediatrics. Patients had the right to choose a department in the neighbouring county. After the creation of the new regions, the RSD thus had four paediatric departments, and the patients were also free to select any of these or any other department outside the RSD (at the same level of specialization). There are no private hospitals with in-patient paediatric services in the area. Kolding Hospital was located in the former County of Vejle. Before the formation of the Danish regions, physicians and patients were loyal towards their own county in all

four counties in general, and in the County of Sønderjylland in particular.

The number of acute and planned paediatric admissions in the RSD reported by departments of paediatrics and the municipalities were drawn from "eSundhed", which is a part of the Danish National Hospital Registration [10]. We obtained data from three years before to three years after the reform, viz. 2004-2009.

All residents and newborns in Denmark are given a unique 10-digit person identification number (CPR number) [11]. The CPR number was used to define the number of individual children admitted each year. The total population divided according to age groups and per municipality was registered from Statistics Denmark [12]. Distances to the departments of paediatrics were estimated as the distance from the centre of the municipalities using the Krak internet site [13].

*Trial registration:* not relevant.

## RESULTS

**Table 1** shows the number of all acute paediatric admissions at the Department of Paediatrics at Kolding Hospital and at the three other paediatric departments in the RSD. From 2006, i.e. the last year before the new regions were established, to 2009, the number of admissions at the Department in Kolding rose by 46.1% (from 3,376 to 4,931 admissions) for children living in the RSD. At the other departments, the number only rose by 11.4% (from 11,398 to 12,698 admissions). The number of admissions to the department in Kolding of children from the CDR fell from 1,275 to 384 (69.9%). At the three other paediatric departments, the number increased slightly by 6.6% (from 243 to 259 admissions).

From 2006 to 2009, the number of planned admissions at the Department in Kolding for children living in the RSD increased by 65.0% (from 360 to 594 admissions), while at the three other paediatric departments in the region, the number decreased by 5.2% (from 1,763 to 1,671 admissions) (**Table 2**). During the same period, the number of planned admissions to the Department in Kolding of children from the CDR diminished by 78.6% (from 159 to 34).

With regard to patients from Christiansfeld (located in the former County of Sønderjylland) and from Kolding's three neighboring municipalities (Vejle in the former County of Ribe, Haderslev in the former County of Sønderjylland and Middelfart in the former County of Fyn), the number of admissions at the Department of Paediatrics in Kolding rose from 487 in 2006 to 828 in 2007, to 1,037 in 2008 and to 1,394 in 2009 (a total increase of 186.2%). For comparison, the corresponding numbers of all paediatric admissions of children from

FIGURE 1

Before the reform. The four counties before they were merged to form the Region Southern Denmark with the department of paediatrics located in Kolding, Esbjerg, Sønderborg and Odense. As from January 1 2007 Christiansfeld (shaded), which was previously situated in the County of Sønderjylland, became part of the new Kolding Municipality.



FIGURE 2

After the reform. Region Southern Denmark (light shaded) and Central Denmark Region (dark shaded) including the location of the paediatric departments. The two municipalities Horsens and Hedensted previously situated in the County of Vejle became part of the Central Denmark Region. Kolding's neighbouring municipalities Vejle (previously Ribe County), Haderslev (previously Sønderjylland County) and Middelfart (previously Fyn County) are indicated.



the RSD were 16,897, 18,907, 18,634 and 19,894, respectively (a total increase of 17.7%).

From 2004 to 2006, approximately 22% of all paediatric admissions of children living in the RSD took place at the Department of Paediatrics in Kolding. This increased to 24.1% in 2007, to 26.4% in 2008 and to 28.1% in 2009 (an increase of 27.7%).

The number of admissions for all children below 15 years of age living in the RSD rose from 69 per 1,000 children in 2004 to 81 in 2009, which corroborates the increase for children living in the nearest catchment area of Kolding Hospital (the municipalities: Kolding, Vejle and Fredericia) from 68 to 80 per 1,000 children. The readmission rate for children living in the RSD has remained unchanged from 2004 to 2009 and for Kolding Hospital it was 1.3 as compared with 1.4 for all the paediatric departments.

## DISCUSSION

The study of the trends in patient-seeking behaviour as a consequence of the elimination of the counties and the establishment of the new and larger administrative units by January 2007 revealed major changes. The number of acute admissions to the four paediatric departments in the RSD increased by 10.5% (from 1,518 to 1,678) during the first year for children living in the CDR; an increase that mirrors the 12.5% (from 14,774 to 16,618) increase for children living in the RSD. For planned admissions, the increase of 4.8% was slightly lower than the increase of 7.8% for children living in the RSD. These results indicate that 2007 saw no major differences in the overall patient-seeking behaviour to the paediatric departments in the RSD for children living in the CDR. However, from the summer of 2008, the CDR projected to treat all neonatal patients and by January 2009 all paediatric patients from the region at one of the paediatric departments in the CDR. This change in policy led to a major decrease in the number of admissions at the Department of Paediatrics in Kolding of children from CDR. To be admitted to a paediatric department in the CDR, the patients from the two municipalities (Horsens and Hedensted) previously situated in the former County of Vejle had to drive to Randers or Aarhus (however, being a university hospital, the department in Aarhus cannot be chosen freely). Only the distance from Horsens to Aarhus is equivalent to the one from Horsens to Kolding. The other distances are considerably longer [13] which indicates that the administrative/political decision was the most important determinant shaping the flow of patients; a flow that was probably mediated through the referral patterns of the general practitioners [9, 14].

Before the formation of the regions, most patients used the paediatric department in their own county, even though for some patients this meant travelling con-

TABLE 1

Acute paediatric admissions in The Region of Southern Denmark and for all children at the Department of Paediatrics at Kolding Hospital and at the three other paediatric departments in The Region of Southern Denmark.

	Children from RSD			Children from CDR			All admissions		
	KH <sup>1</sup>	other <sup>2</sup>	all <sup>3</sup>	KH <sup>1</sup>	other <sup>2</sup>	all <sup>3</sup>	KH <sup>1</sup>	other <sup>2</sup>	all <sup>3</sup>
2004	3,256	10,625	13,881	1,208	247	1,455	4,525	11,089	15,614
2005	3,239	10,696	13,935	1,276	210	1,486	4,570	11,132	15,702
2006	3,376	11,398	14,774	1,275	243	1,518	4,721	11,999	16,720
2007	4,083	12,535	16,618	1,404	274	1,678	5,556	13,130	18,686
2008	4,451	12,043	16,494	1,172	175	1,347	5,727	12,534	18,261
2009	4,931	12,698	17,629	384	259	643	5,411	13,298	18,709

CDR = The Central Denmark Region; KH = Kolding Hospital; RSD = The Region of Southern Denmark.

1) Number of admissions at the Department of Paediatrics at KH.

2) Number of admissions at the three other departments of paediatrics in the RSD.

3) Total number of paediatric admissions at any of the four paediatric departments in the RSD.

TABLE 2

Planned paediatric admissions in the Region of Southern Denmark, from the Central Denmark region and for all children at the Department of Paediatrics at Kolding Hospital and at the three other paediatric departments in the Region of Southern Denmark.

	Children living in RSD			Children living in CDR			All paediatric admissions		
	KH <sup>1</sup>	other <sup>2</sup>	all <sup>3</sup>	KH <sup>1</sup>	other <sup>2</sup>	all <sup>3</sup>	KH <sup>1</sup>	other <sup>2</sup>	all <sup>3</sup>
2004	356	1,767	2,123	138	133	271	495	1,924	2,419
2005	342	1,757	2,099	99	116	215	442	1,894	2,336
2006	360	1,763	2,123	159	91	250	521	1,881	2,402
2007	473	1,816	2,289	151	111	262	626	1,974	2,600
2008	455	1,685	2,140	86	65	151	541	1,845	2,386
2009	594	1,671	2,265	34	104	138	632	1,844	2,476

CDR = The Central Denmark Region; KH = Kolding Hospital; RSD = The region of Southern Denmark.

1) Number of admissions at the Department of Paediatrics at KH; 2) Number of admissions at the three other department of paediatrics in RSD; 3) Total number of paediatric admissions at any of the four paediatric departments in RSD.

siderably longer for treatment. Patients from Haderslev had to travel on average of 60 km to the paediatric department in Sønderborg, instead of only 35 to the one in Kolding. Patients from Middelfart had to travel on average 45 km to the department in Odense instead of only 30 to Kolding. Finally, the distance from Vejle to Esbjerg is approximately 45 km and to Kolding 40 km [13]. If the administrative structure is an important factor for patients' choices, one would expect a shift in hospital-seeking behaviour following the creation of the RSD and thereby the elimination of the political wish to keep the patients within the former counties. This would imply that patients from these three municipalities would become more prone to choose the Paediatric Department in Kolding. This is, in fact, what happened as an increase in the number of admissions from 2006 to 2009 of 186.2% was seen as compared with an increase in all admissions of children living in RSD of 17.7%. This is confirmed by the fact that there has been a shift in the overall paediatric hospital-seeking behaviour in the RSD

so that the Department of Paediatrics in Kolding is treating a considerably higher proportion of children living in the RSD after the old county borders disappeared. These findings corroborate a study from Eastern Denmark which showed that after eliminating the restrictions caused by the borders between three counties, patients referred for planned admissions tended to choose the nearest hospitals [5]. Other studies have also pointed at distance as the main or one of the main factors when patients execute their right to select a hospital [6, 8].

It is, of course, difficult to evaluate to which extent the shift in hospital-seeking behaviour is due to a change in the referral patterns of the private practitioners and to which extent it reflects patient priorities. We found a shift in hospital-seeking behaviour for both acute and planned admissions which indicates that the focus on making waiting time and quality known to the users had no impact on which hospital the patients chose as this would be expected to have the highest impact on planned admissions. This corroborates international studies reporting only limited effects of information about the quality of care on patients' choice of provider [15, 16].

The increase in admissions from the RSD to the Department of Paediatrics in Kolding could stem from different practices at the Department as compared with the other departments in the region. However, the increase in admissions per year per 1,000 children from 2004 to 2009 was the same in all three municipalities traditionally seeking the services from the Department (very few children from these municipalities are treated elsewhere) as for all paediatric admissions in the RSD. This suggests the existence of a common admission and treatment practice. If children were readmitted to a higher extent, this would affect the number of admissions. However, an analysis of the number of admissions per patient reveals that the readmission rate has remained unchanged both at the Department in Kolding and at the three other paediatric departments in the RSD from 2004 to 2009. This indicates that the change in admissions does not stem from changes in practices at the Department, but may be caused by factors outside the hospital.

## CONCLUSION

The Department of Paediatrics at Kolding Hospital has experienced major changes in patient-seeking behaviour following the creation of the larger administrative units by January 2007. It seems difficult for patients to choose treatment at a hospital in another administrative unit even though they have the right to do so [1]. Before January 2007, most patients living in Kolding's three neighbouring municipalities situated in other counties often travelled twice the distance for treatment instead of

choosing the Kolding Department, but this practice changed immediately after the creation of the regions when the political/economic reasons for maintaining this practice disappeared. Likewise, initially, the patients from the northern part of the former County of Vejle continued to seek the Kolding Department, but the political decision to treat patients from the CDR at hospitals in the CDR had a dramatic effect on the number of patients from the CDR being treated in Kolding, even if the distance to the alternative paediatric departments was considerably longer, and even though the general practitioners were used to collaborate with the Department in Kolding.

The regions are obliged to draw up a comprehensive plan for organizing the health services [17]. The RSD therefore aims at achieving close collaboration between the municipalities, the general practitioners and the hospitals [18]. Furthermore, it is important to ensure that the hospitals have the necessary capacity to treat all patients. These obligations are difficult to fulfill unless the demand for treatment is known. Furthermore, treatment tends to be cheaper at the region's own hospitals than in hospitals in other regions. Therefore, there is a conflict between the political demand to optimize the utilization of resources spent on health and to ensure comprehensive health care, and the political wish to provide patients a free choice.

Danish patients have the right to freely choose the hospital at which they want to be treated [1], and obviously this works – at least to some extent – within the RSD. However, for patients living in a different administrative unit, the political and economic decisions seem to be more important and one could question whether the patients in these cases really have a free choice.

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**CONFLICTS OF INTEREST:** none

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