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Research paper

Impact of social deprivation on length of stay for common infectious diseases in two French university-affiliated general pediatric departments

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ABSTRACT

Background: Adult deprived patients consume more healthcare resources than others, particularly in terms of increased length of stay (LOS) and costs. Very few pediatric studies have focused on LOS, although the effect of deprivation could be greater in children due to the vulnerability of this population. Our objective was to compare LOS between deprived and nondeprived children hospitalized for acute infectious diseases in two university-affiliated pediatric departments located in a low-income area of northern Paris.

Methods: We performed a prospective observational multicenter study in two university-affiliated hospitals, Hôpital Robert-Debré and Hôpital Jean-Verdier. All the patients under 15 years of age admitted to the general pediatric department for pneumonia, bronchiolitis, gastroenteritis, or pyelonephritis between 20 October 2016 and 20 March 2017 were included. Deprivation was assessed with an individual questionnaire and score (EPICES). Endpoints included length of stay, costs, and readmission rates at 15 days in each quintile of deprivation. Multivariate regression assessed the association between deprivation and each endpoint.

Results: A total of 556 patients were included in the study and 540 were analyzed. Sixty percent were boys and the mean age was 9 months ± 18. Bronchiolitis was the most frequent diagnosis (67.8%). Fifty-six percent of patients were considered to be deprived based on the EPICES questionnaire. Mean LOS was 4.6 ± 3.5 days and we found no significant difference in LOS between the different deprivation quintiles ($P = 0.83$). Multivariate regression did not show an association between LOS and deprivation.

Conclusion: There was no difference between deprived and nondeprived patients in terms of LOS. Deprivation may therefore impact hospitals in other ways such as admission rates. The impact of deprivation during hospitalization for chronic diseases should also be investigated.

1. Introduction

Many studies have shown that deprivation was associated with increased healthcare resource consumption, particularly in terms of increased length of stay (LOS) and costs for hospitalized patients. In the United States, this association has been shown since 1988 [1]. In France, a study conducted in 1998 in 21 public hospitals [2] showed that, for a given disease-related group (DRG), deprived patients' mean LOS was 2.5 days longer compared to nondeprived patients. Other studies have since confirmed the impact of deprivation on LOS in adults, reporting a LOS increase of 5–48% compared to the general population [3,4].

It is hypothesized that the effect of deprivation on LOS could be greater in children than adults, due to the vulnerability of the population and the obvious involvement of the family environment

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in the child's health. Indeed, the decision to discharge a patient often depends on this environment. Similarly, the promotion of alternatives to hospitalization has limitations in the case of families with difficult living situations [5]. The few studies on the impact of deprivation in pediatric populations have found an increase in the admission rate in neonatology [6] and emergency departments [7] for either a respiratory infection [8–10] or a voluntary drug intoxication [11], greater difficulty in accessing primary care [12], more frequent use of hospital emergency departments [13], and an increased risk of premature birth [14,15] and/or low birth weight [16].

Due to their frequency, infectious diseases are a significant challenge for hospitals, in particular for general pediatric departments. The deprivation of children hospitalized for infectious diseases could therefore have a major impact on hospitals' efficiency, but the few studies that have looked at the impact of deprivation in that population have found conflicting results [17,18].

Our objective was therefore to explore the relationship between LOS and deprivation in a large study sample of children admitted for the most common acute infectious diseases in two university-affiliated general pediatric departments located in a low-income area in northern Paris.

2. Methods

2.1. Study design

We conducted a prospective observational multicenter study in two Parisian university-affiliated pediatric hospitals, Robert-Debré Hospital (Paris) and Jean-Verdier Hospital (Bondy). Those hospitals provide care for patients from several Paris districts and the whole Seine-Saint-Denis department, which has a high rate of deprivation. The study was approved by an independent ethics committee (project number, 2016-12-09), and the French Data Protection Agency (CNIL) granted its agreement for the data collection (declaration 1997097).

2.2. Population

Patients under 15 years of age who were hospitalized overnight in the general pediatric departments of the participating hospitals for one of the four most common acute infectious diseases in children (bronchiolitis, gastroenteritis, pneumonia, and acute pyelonephritis) were included in the study. Exclusion criteria were as follows: children who were not living at their parents' place of residence or who were living abroad, children whose parents were absent at the time of inclusion, and patients developing one of the four infectious diseases as a nosocomial infection. The inclusion period lasted from 20 October 2016 to 20 March 2017 (winter epidemic period).

2.3. Deprivation assessment

Deprivation was assessed with the EPICES questionnaire (évaluation de la précarité et des inégalités de santé dans les centres d'examens de santé) (Appendix A), which was developed by the French statutory health insurance (SHI)'s health examination centers to assess the deprivation of their patients [19]. It contains 11 binary questions that take into account different dimensions of deprivation such as financial security, leisure activities, and social support. Each answer is associated with a coefficient to calculate a score, which varies between 0 (no deprivation) and 100 (maximum deprivation) and can be divided into national reference quintiles: quintile 1 = [0.0–7.1[, quintile 2 = [7.1–16.56[, quintile 3 = [16.56–30.17[, quintile 4 = [30.17–48.52[and quintile 5 = [48.52–100]. Patients who score into quintiles 4 and 5 are considered to be deprived. The relevance of the quantitative aspect of the EPICES score has previously been shown to be associated with indicators of social position, lifestyles, access to care, and health [20]. It has also been used in different pathologies and different care settings in the past [21–24].

2.4. Endpoints

The primary endpoint was patients' length of stay (LOS), overall and for each quintile of the EPICES score. Secondary endpoints were the costs associated with each stay and readmissions at 15 days, overall and for each quintile of the EPICES questionnaire.

Patients' admission data were extracted from the two participating hospitals' discharge database to provide access to their LOS, DRG, and other payment information such as daily supplements, as well as admission and discharge mode and admission severity. LOS was derived from discharge data and therefore corresponded to the number of nights spent in the hospital. Costs were calculated from the perspective of all payers (SHI, private health insurance and patients' out-of-pocket expenses) using the SHI's tariffs of the DRG and adding daily supplements (for example for intensive care). Admission severity was derived from the last letter of the DRG, which generally varies from 1 to 4 with increasing severity level. It is attributed based on age and the presence of specific complications or comorbidities, which vary depending on the DRG.

2.5. Statistical analysis

The characteristics of the population were described with mean, standard deviation (SD), median and interquartile range for quantitative data, and number and percentage for qualitative data. The difference in endpoints between quintiles of deprivation was tested with a Kruskal-Wallis test because of the nonequality of the variance, with a 0.05 significance level.

A linear model was chosen after making sure the assumptions were verified. A bivariate analysis first examined the relationship between the explanatory variables and the factors potentially associated. Multivariate linear regression models were carried out to assess the association between LOS and deprivation (EPICES score) as well as costs and deprivation. There were too few readmissions to model the association. Additional adjustment factors including age, hospital, sex, diagnosis, severity, and admission and discharge modes were entered in the models.

All analyses were carried out with SAS software, version 9.4 and R software, version 3.3.0.

3. Results

3.1. Description of the population

Six hundred seventy-seven patients were hospitalized for one of the four diagnoses during the study period. Five hundred fifty-six patients met our inclusion and exclusion criteria and an additional 16 had to be excluded from the analysis (Fig. 1).

The mean age was 9 months and there were more boys than girls (Table 1). Bronchiolitis was the most frequent diagnosis. Based on the EPICES score (quintiles 4 and 5), 56.1% of the patients were considered to be deprived, although this differed depending on the diagnosis (from 49.4% for gastroenteritis to 69% for pneumonia). Nearly one-third of the admissions (30.9%) were for severe conditions, and there was no statistical difference in severity or age in the different deprivation quintiles ($P = 0.85$ and $P = 0.14$, respectively).

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