COVID-19- related Healthcare Resource Utilization and Direct Costs in Paediatric Patients In Germany: A Population-Based Study

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INTRODUCTION

- Although COVID-19 is less severe in paediatrics compared to adults, it has been estimated that ~20% of hospitalized paediatric patients require anti-SARS-CoV-2 therapy [1], of whom 3% require intensive care support [2]. Patients with underlying health conditions are at an increased risk of poorer COVID-19 related outcomes [1,3].
- Over the course of the pandemic, paediatric morbidity decreased in Germany, except during Delta variant predominance, where an increase in hospitalisations was observed among those aged less than 5 years [4].
- Little is known about the economic burden of COVID-19 in paediatrics in Germany. Evidence is needed to quantify the patient-level costs which can be used to inform healthcare budget allocation and health policy.

OBJECTIVE

This study aimed to quantify healthcare resource utilization and associated among paediatric patients with a recorded COVID-19 diagnosis in the outpatient and hospital setting in Germany, separately.

METHODS

Study design: Retrospective | Observational | Descriptive | Population-based | Real World

Data source: This study used a database consisting of a random subsample of the German Statutory Health Insurance (SHI) claims dataset; covering approximately 6% of the German population and has anonymized record-level patient data from over 50 sickness funds within the SHI system. Data within the database is representative of the age and sex distributions of the Germany population.[3]

Two non-mutually exclusive study cohorts:

Outpatient Cohort: Patients with a COVID-19 diagnosis recorded in the outpatient setting between April 2020 and December 2021 were included. Results were reported per diagnosis quarter and for the first COVID-19 diagnosis only. Note: Patients in this cohort may have also received COVID-19 care outside of the outpatient setting (i.e. inpatient care).

Hospitalized Cohort: Patients with a recorded primary or secondary COVID-19 diagnosis at hospital discharge, between April 2020 and October 2022. Results were reported per 90-day episode.

Eligibility criteria:
- Aged ≥1 and <18 years
- A confirmed COVID-19 diagnosis where the first COVID-19 diagnosis was observed within the index period
- Continuously insured with an insurance provider within the SHI claims database for a minimum of 12 months prior to index date.

Figure 1. Outpatient cohort study design schematic

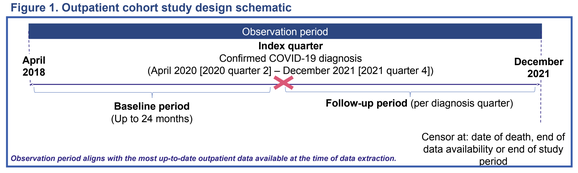
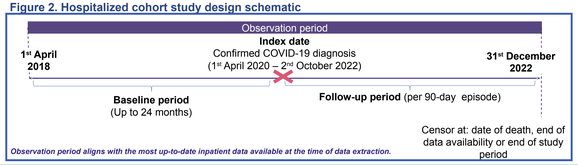


Figure 2. Hospitalized cohort study design schematic



METHODS (continued)

Outcomes:
- Sociodemographics
- Clinical characteristics
- Medication use
- Outpatient Consultations
- Hospitalizations
- Hospital Length of Stay (LoS)
- Critical Care Admissions
- Total Direct Healthcare Costs

Stratifications:
- Age
- Risk of severe COVID-19[5]

RESULTS

In total, 104,656 COVID-19 paediatric patients (1-17 years) were included in the outpatient cohort, and 3,129 in the hospitalized cohort (Table 1).

Table 1. Baseline sociodemographic and clinical characteristics of COVID-19 paediatric patients within the outpatient and hospitalized cohorts

	Outpatient (n=104,656)	Hospitalized (n=3,129)
Sex (male), n (%)	54,066 (51.7)	1,551 (49.6)
Age (in years) at index		
≥1 and <5, n (%)	25,597 (24.5)	1,132 (36.2)
≥5 and <12, n (%)	41,129 (39.3)	863 (27.6)
≥12 and <18, n (%)	37,930 (36.2)	1,134 (36.2)
At risk of severe COVID-19, n (%)	64,449 (61.6)	2,569 (82.1)
Immunocompromised status (immunocompromised), n (%)	129 (0.1)	27 (0.9)
Quan-Charlson Comorbidity Index (Quan-CCI), mean (SD)	0.2 (0.5)	0.4 (0.9)

- In the **outpatient cohort**, approximately half were female, ~25% were aged <5 years, over half were at risk of severe COVID-19, 0.1% were immunocompromised and the mean Quan-CCI score was 0.2.
- In the **hospitalized cohort**, approximately half were female, ~36% were aged <5 years, the majority were at risk of severe COVID-19, 0.9% were immunocompromised and the mean Quan-CCI score was 0.4.

HCRU IN THE OUTPATIENT COHORT

- Amongst the outpatient cohort, 76.8% had ≥2 family physician consultations and 28.8% had ≥1 outpatient specialist consultation during the COVID-19 diagnosis quarter (Figure 3).
- The proportion of patients attending outpatient consultations (family physician and specialist) was highest in the youngest age group (aged 1-4), and in those at risk of severe COVID-19 (see Figure 3 for all stratified results).
- COVID-19 medication use was low overall (n=820; 0.8%) but was greatest in the aged ≥1 to <5 group (1-4 years: 2.9% [n=739]; 5-11 years: 0.2% [n=75]; 12-17 years: <0.1% [n=6]) and those at risk of severe COVID-19 (at risk; 1.0% [n=666]; not at risk: 0.4% [n=154]) .

HCRU ASSOCIATED COSTS IN THE OUTPATIENT COHORT

- The median (Q1, Q3) cost per COVID-19 diagnosis quarter per patient was €1,095 (€192, €1,417) which includes family physician, outpatient specialist and COVID-19 related medication costs.
- The median cost per COVID-19 diagnosis, per patient was highest in those aged 12-17 years (1-4 years: €572 [Q1, Q3: €195, €1,403]; 5-11 years: €871 [€202, €1,397]; 12-17 years: €1,256 [€189, €1,422]), and those at risk of severe COVID-19 (at risk: €1,263 [€210, €1,385]; not at risk: €576 [€225, €1,401]).

HCRU IN THE HOSPITALIZED COHORT

- The overall mean (SD) length of hospital stay (LoS) in non-critical care admissions, per patient per admission, was 8.5 (9.0) days, which was highest in those aged 1-4 years (9.3 [10.0] days), and those at risk of severe COVID-19 (9.2 [12] days) (Figure 4).
- 13% (n=406) of patients were admitted to critical care. The mean LoS in critical care, per admission, was 49.2 (69.0) days. When stratified by age and risk of severe COVID-19, LoS in critical care was greatest among those aged 1-4 years (50.2 [69.0] days), and those at risk of severe COVID-19 (52.3 [67] days) (Figure 5). However, <5 patients received mechanical ventilation.
- Only 13 (0.4%) patients received COVID-19 medication during their hospitalization.

HCRU ASSOCIATED COSTS IN THE HOSPITALIZED COHORT

- The median (Q1, Q3) cost per admission was €12,503 (€4,307,€17,829); this was highest in those aged 1-4 years (1-4 years: €14,930 [€4,123; €16,482]; 5-11 years: €13,948 [€5401; €14,829]; 12-17 years: €9,100 [€3,942; €16,380]) and at risk of severe COVID-19 (at risk: €13,049 [€4,849, €15,201]; not at risk: €9,807 [€4,307, €17,834]) (Figure 6).
- When stratified by type of inpatient admission, similar patterns were noted, with the highest costs observed in those with a critical care admission.

RESULTS (continued)

Figure 3: Outpatient consultations, per COVID-19 diagnosis quarter, for the Outpatient Cohort

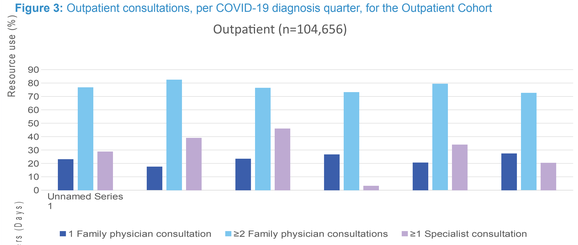


Figure 4: Mean length of COVID-19-related non-critical care stay in hospital, per admission per patient for the Hospitalized Cohort

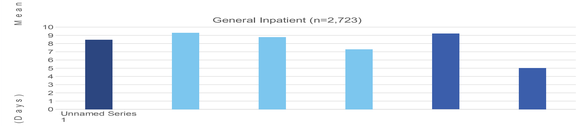


Figure 5: Mean length of COVID-19-related critical care stay in hospital, per admission per patient for the Hospitalized Cohort

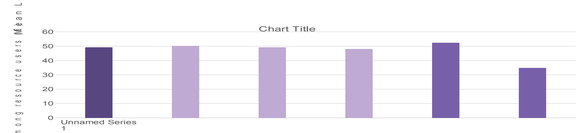
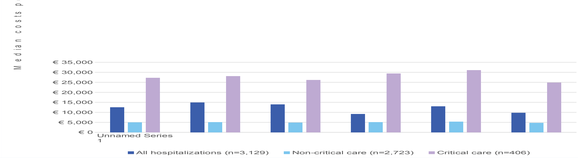


Figure 6: Median COVID-19-related hospital costs, per admission per COVID-19 episode, within the Hospitalized Cohort



CONCLUSIONS

- **The hospitalized cohort had a greater proportion of patients that were aged <5 years and at an increased risk of severe COVID-19.**
- **High HCRU and associated costs have been largely driven by COVID-19-related hospitalizations, particularly critical care admissions.**
- **HCRU associated costs were higher in those aged 1-4 years in the hospitalized cohort, whereas in the outpatient cohort costs were highest in 12-17 years.**
- **HCRU associated costs were higher among those at risk of severe COVID-19, across both cohorts.**
- **Future research should explore the longer-term healthcare burden of COVID-19, and impact of the different COVID-19 variants on healthcare systems in Germany.**

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