

Testing strategy for SARS-CoV-2 in the paediatric emergency department

The rapid spread of the novel coronavirus (severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)) in Italy forced a prompt hospital reorganisation in the past 2 months. Every clinic has been divided into two separate departments, based on the detection of SARS-CoV-2 in the nasopharyngeal swab.¹ In children, three main variables complicate this: first, the not optimal sensitivity of nasopharyngeal swabs, mainly due to technical difficulties²; second, the need of a caregiver during the hospital stay; finally, the high number of paediatric diseases manifesting with fever or cough, thus sharing symptoms of COVID-19, which cause about 25% of emergency department (ED) admissions.³ All these elements make the paediatric testing strategy more challenging.

We performed an observational study at Regina Margherita Children's Hospital of Turin. Two cohorts of patients were collected: cohort A included all the children admitted to the ED from 2 March 2020 through 22 April 2020, with COVID-19-related symptoms; cohort B was composed of patients without any COVID-19-associated symptoms, who were swabbed as a screening test before hospital admission, between 31 March 2020 and 22 April 2020. Three hundred and forty-four patients were tested, 169 females and 175 males, with a median age of 3.91 years (range, 0–18 years). Two hundred and forty-four patients were enrolled in cohort A, 46.7% were females, equally distributed into age groups. One hundred and sixty children were admitted, and at least one of their parents was tested for SARS-CoV2, proving positive in 18 cases. Twenty-five children were positive for SARS-CoV2, and another five patients were admitted to the COVID department due to the positivity of parents' nasal swab. Clinical findings of cohort A patients are summarised in table 1.

Cohort B was composed of 100 patients, 55% females. A parent of all patients was tested for SARS-CoV2; one child and two parents were positive. We found 7% and 2% of parents in the two cohorts were positive for SARS-CoV-2, despite the local population rate being 0.4%. Only 4 out of 20 of them were mildly symptomatic (cough, low-grade fever or smell and taste dysfunction). Their families were

Table 1 Clinical comparison of COVID-19 children versus other patients seen in the emergency department, Regina Margherita Children's Hospital, Turin

Cohort A (N=244)			
	COVID-19 children (n=30)	Other patients (n=214)	P value
Age groups			
< 1 year, n (%)	6 (20%)	53 (24.8%)	0.6549
1–5 years, n (%)	12 (40%)	66 (30.8%)	0.403
6–10 years, n (%)	8 (26.6%)	47 (22%)	0.6407
11–17 years, n (%)	4 (13.3%)	48 (22.4%)	0.343
Symptoms			
Fever (body temperature >37.5°C), n	28	168	0.083
Dry cough, n	16	68	0.025
Diarrhoea, n	3	28	0.777
Dyspnoea/tachypnoea, n	3	27	1.000
Sore throat, n	1	11	1.000
Smell and taste dysfunction, n	0	0	NA
Chest pain, n	0	6	1.000
Vomiting, n	0	16	0.231
At least one symptom*, n	30	210	1
At least two symptoms*, n	19	100	0.11
At least three symptoms*, n	2	12	0.68
Fever with at least another symptom†, n	18	86	0.0489
Fever with at least one upper airway symptom‡, n	16	65	0.021
Close contact with a COVID-19 relative, n	18	14	<0.01

*Including dry cough, diarrhoea, dyspnoea, tachypnoea, sore throat, smell and taste dysfunction, chest pain or vomiting.

†Including fever, dry cough, diarrhoea, dyspnoea, tachypnoea, sore throat, smell and taste dysfunction, chest pain or vomiting.

‡Including dyspnoea, dry cough, sore throat or smell and taste dysfunction.

composed on average of four people; in 11 cases they reported a confirmed or possible contact with a COVID-19 case.

We analysed the children's symptoms to identify COVID-19 in the paediatric ED. Cough was the only isolated manifestation significantly associated with SARS-CoV-2 infection. Fever was significantly related to COVID-19 only if paired with another symptom. The risk of infection was not associated with the number of symptoms. Conversely, a previous COVID-19 parental contact made it around 10 times more likely that the symptomatic child was affected by COVID-19 (relative risk 9.93).

An asymptomatic child with a forearm fracture and five symptomatic children, all negative for SARS-CoV-2, were allocated to the COVID-19 department based on the caregiver's positive test for SARS-CoV-2. In one of these cases, the child was retested, proving positive.

If one of those misdiagnosed COVID-19 couples (child and caregiver) had been admitted to the COVID-free area, health-care workers might have been exposed to the virus, increasing the risk of nosocomial spread of the infection.⁴

To our knowledge, this is the first report that highlights the importance of

analysing the children's caregivers before hospital admission. Our study suggests that for every 100 children tested in the ED during COVID-19 pandemic, despite a negative result, at least two of them had a parent positive for SARS-CoV2.

For this reason, regardless of the reason for the admission, we propose to regularly test both children and their caregivers on admission to the hospital to increase the sensitivity of the test and to allow the correct allocation of patients, avoiding the in-hospital spread of the infection.

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REFERENCES

- 1 Laboratory testing strategy recommendations for COVID-19: interim guidance. Available: <https://www.who.int/publications-detail/laboratory-testing-strategy-recommendations-for-covid-19-interim-guidance> [Accessed 23 May 2020].
- 2 Wang W, Xu Y, Gao R, *et al.* Detection of SARS-CoV-2 in different types of clinical specimens. *JAMA* (Published Online First: 11 March 2020).
- 3 Barbi E, Marzuillo P, Neri E, *et al.* Fever in children: pearls and pitfalls. *Children* 2017;4:81.
- 4 Kelvin AA, Halperin S. COVID-19 in children: the link in the transmission chain. *Lancet Infect Dis* 2020;20:633–4.