

RESEARCH ARTICLE

Contact tracing, use of surgical masks, hand hygiene and social distancing represent a bundle of effective measures to control SARS-CoV-2 spreading among healthcare workers in a paediatric hospital

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Keywords

Contact tracing • Surgical masks • Hand hygiene • Social distancing • SARS-CoV-2 • Paediatric hospital

Summary

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is the causative agent of pandemic coronavirus disease 2019 (COVID 19). Protection from virus exposure in children's hospital is a pivotal aspect of SARS-CoV-2 pandemic control. Healthcare workers (HCW) could play an important role in viral infection in-hospital spread. Infection control measures were thus implemented to protect fragile patients and healthcare workers. We retrospectively described a HCW infection-scuse-series due to SARS-CoV-2 from February 24th to July

31st at the IRCCS Istituto Giannina Gaslini. Seven separate cases of SARS-CoV-2 infection were observed among healthcare workers, with a total of 395 contacts, and 23 (6%) secondary case. A program of contact tracing and quarantine of SARS-CoV-2 positive HCW, screening of asymptomatic HCW, use of surgical masks, hand hygiene, social distancing and use of PPE in COVID-19 cases assistance prevented the spread of the virus to patients and blocked the diffusion within the hospital.

Introduction

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is the causative agent of pandemic coronavirus disease 2019 (COVID 19). In countries experiencing high rates of infection as Italy (Supplementary Fig. 1), pediatric population represents a minority of COVID-19 patients, even if severe clinical cases can be observed in children with risk factor [1-3]. Protection from SARS-CoV-2 exposure in children's hospital, where many fragile patients (e.g small birth weight and/or preterm neonates, cancer or transplants patients etc) are treated, is a pivotal aspect of SARS-CoV-2 pandemic control. Healthcare workers (HCW) could play an important role in viral infection spread to patients, colleagues or people outside healthcare system by acquiring infection inside or outside the hospital [4, 5]. In light of this, infection control measures were implemented to protect patients and HCW themselves. On February 21st, 2020, the first autochthonous case of COVID-19 was diagnosed, and on March 9th the Italian government implemented nation-wide measures to limit viral transmission. At the same time, Health Care Facilities adopted measures to reduce in-hospital spread of SARS-CoV-2. The aim of this study is to share our experience in the management of pandemic in a pediatric

hospital and to describe a case series of HCW infections, their management and the active surveillance proposed to individuate possible pre-symptomatic subjects with a screening campaign in HCW.

Materials and methods

We retrospectively described a case-series of HCW infections due to SARS-CoV-2 from February 24th to July 31st in the IRCCS Istituto Giannina Gaslini (IGG), a tertiary care children hospital, in Genoa, Italy. Since the beginning of the pandemic, IGG has set up a Crisis Unit to manage the emergency situation within the hospital. The management of HCW infections has been entrusted to Department of Preventive Medicine, in collaboration with the Infection Control Group about in-hospital contact tracing. Infectious Disease specialist has been consulted to define cases and contacts-of-cases, especially in hospitalized patients. SARS-CoV-2 detection on nasopharyngeal swabs was performed by Allplex 2019-nCoV RT-PCR Assay (Seegene Inc. Seoul Korea) that identifies 3 target genes (E, N and RdRP) of SARS-CoV-2 in a multiplex PCR single tube reaction.

Results

From February 24th to July 31st, 7 HCW index-cases determined as many as clusters involving a total of 395 contacts and 23 (6%) secondary cases, as shown in Figure 1.

Two clusters were observed before implementation of more stringent control measures. The first was linked to a patient and her mother, admitted to Rehabilitation department. Infection probably derived from a grandparent who visited the patient despite hospital warning and without declaring presence of COVID-19 symptoms to hospital staff. Patient presented mild fever and upper respiratory tract infection signs, while the mother declared only anosmia and ageusia. Since SARS-CoV-2 infection was not initially suspected, no HCW wore the recommended personal protective equipment (PPE) during contact with the index patient. Consequently, in the following 14 days, 9 (5%) of 179 traced contacts was infected. 5 of them were positive at in-hospital screening, while 4 developed symptoms at home and they were considered clinically documented and quarantined. The second cluster involved 48 HCW and 7 (14%) become infected. This cluster was linked to an intensive care unit (ICU) nurse who got the infection outside the hospital (probably on vacation) and infected shift colleagues which probably caused some further secondary case. Since hospital procedures in ICU called for wearing surgical masks, gowns and gloves, other than appropriate hand hygiene, no infection was documented in patients assisted by infected nurses. Both clusters were concomitant with infection peak in Liguria region (and Italy) (Supplementary Figs. 1, 2). After these clusters, IGG immediately activated an active search program of possible pre-symptomatic cases with contact tracing, test and quarantine of positive subjects, mandatory use of surgical masks

and further implementation of hand hygiene and social distancing [5-7]. Screening was then extended to all HCW. This policy, together with hospital split and national lockdown, resulted effective in reducing in-hospital virus diffusion. In the following days we observed 5 further clusters with 4 of them, in short time from the second one, during the most aggressive phase of SARS-CoV-2 infections in Italy and Liguria (Supplementary Figs. 1, 2). Patients probably already incubating the disease at time of tightening of control measures. The number of secondary cases was limited despite a not negligible number of contacts at least in one of them (Fig. 1). In the same period, a total of 30 patients with SARS-CoV-2 infection were managed by HCW with the use of PPE recommended for COVID-19 patient care and no one acquired the virus. After the last identified cluster, from March 31 a total of 2,331 HCW were periodically tested during the hospital screening program: 11 (0.4%) had at least 1 positive test (the last one on May 18th), but no secondary case occurred.

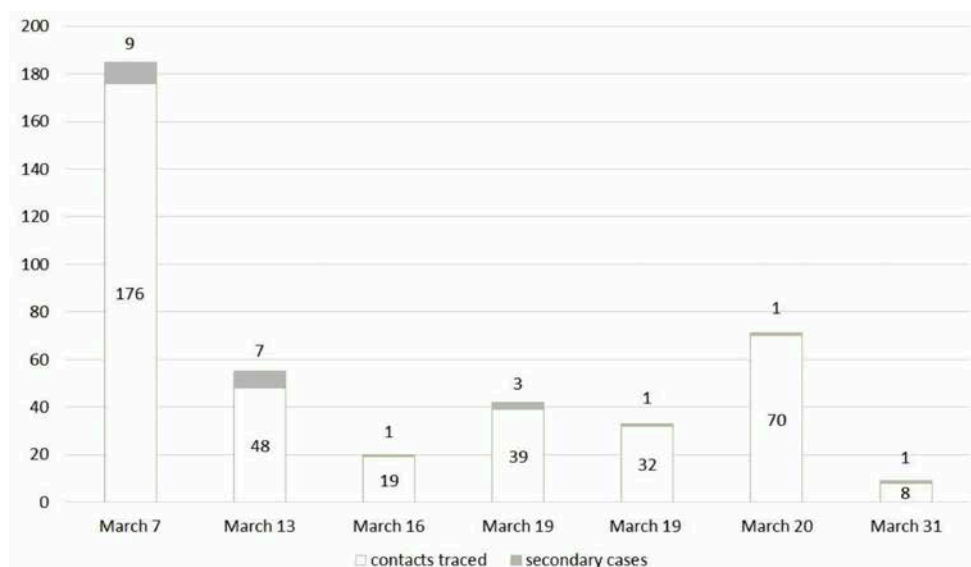
Discussion

On February 21st, 2020, the first autochthonous Italian case of COVID-19 was diagnosed, and on March 9th the Italian Government implemented nation-wide measures to limit viral transmission.

The IRCCS Istituto Giannina Gaslini, Genova-Italy is a tertiary pediatric care hospital located in the North-West of Italy (Liguria), a region strongly involved in SARS-CoV-2 infection spread (Supplementary Figs. 1, 2).

From February 25th the Hospital Crisis Team adopted measures to reduce the risk of in-hospital spread of SARS-COV-2. Firstly, all HCW dealing with suspect or confirmed COVID-19 patients had to wear appropriate PPE recommended for COVID-19 patient care: liquid-repelling gowns, double gloves, a class 2 filtering face-

Fig. 1. Contact tracing in Italy, 2020.



piece respirator (FFP2) and eye protection (goggles or face shield). Meanwhile, hospital access was restricted to HCW and only one caregiver for each patient was allowed. All people accessing hospital had to undergo temperature check and were asked for presence of symptoms possibly related with COVID-19. Moreover, courtesy visits to patients were forbidden as well as access for all categories of non-HCW (e.g. administrative staff, teachers, medical students, volunteers, etc.) and all non-clinical activities were closed. At this time, nasopharyngeal swab with RT-PCR-SARS-CoV-2 detection was performed only in children who entered the emergency room with evocative symptoms for COVID-19 (or developed these symptoms after admission) or in HCW who became symptomatic during hospital shift. HCW who presented symptoms at home were discouraged to attend work and were quarantined. These cases were considered as "clinically documented". In the meantime, patients, their caregivers and other HCW who were in contact with a suspected HCW index-case in the last 3 days before symptoms development were traced and tested. Furthermore, from March 14th the IGG crisis team blocked all medical activities that did not have an urgent/emergency character or that cannot be postponed. Hospital activity was organized in 2 separated channels: one for management of patients considered at risk or with suspect or confirmed SARS-CoV-2 infection (COVID-19-Hospital) and the other for all other patients. From the same day all HCW had to wear surgical masks [8] even if not involved in COVID-19-Hospital activities, in addition to hand hygiene with soap or isopropyl alcohol and other standard isolation procedures according with the type of possible pathogens transmission [9]. A screening program of all HCW was also implemented to detect possible pre-symptomatic carriers [5, 6]. Screening firstly involved HCW from Emergency Department, Infectious Diseases unit, Intensive Care Unit, Obstetric Department and Home-Care Service, then it was gradually extended to HCW from all other departments. Pregnant women at 37th week of gestation were screened even in absence of symptoms or contacts at risk before delivery, as well as oncologic children who had to be transferred to an adult's center to undergo fractionated radiotherapy for malignancy [10].

Conclusions

The initial IGG approach was to test all symptomatic HCW and trace and test all their contacts, always associated with social distancing, use of surgical masks and hand hygiene procedures. IGG policy for healthcare associated infections has been documented to be effective in the diffusion containment of other pathogens [9] and this approach surely played a positive role also in reducing SARS-CoV-2 diffusion at least to patients managed by pre-symptomatic HCW. Despite increased cost and depletion of supply of masks in health systems, the IGG approach together with national lockdown (HCW

contact tracing/quarantine, screening, widespread use of surgical masks and hand hygiene, and use of PPE in COVID-19 cases assistance) was effective in containing the spread of SARS-CoV-2 within the hospital since, in our experience, the major source of SARS-CoV-2 infection in a pediatric hospital was represented by people coming from outside, including HCW [4, 5].

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

All authors should have made substantial contributions to all of the following. DLM, OV, MP, CS, AM: conception and design of the study, acquisition of data, analysis and interpretation of data; drafting the article or revising it critically for important intellectual content.

MM, GB, EDM: drafting the article and revising it critically for important intellectual content.

EC: conception and design of the study, acquisition of data, analysis and interpretation of data; final approval of the version to be submitted.

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Supplementary data

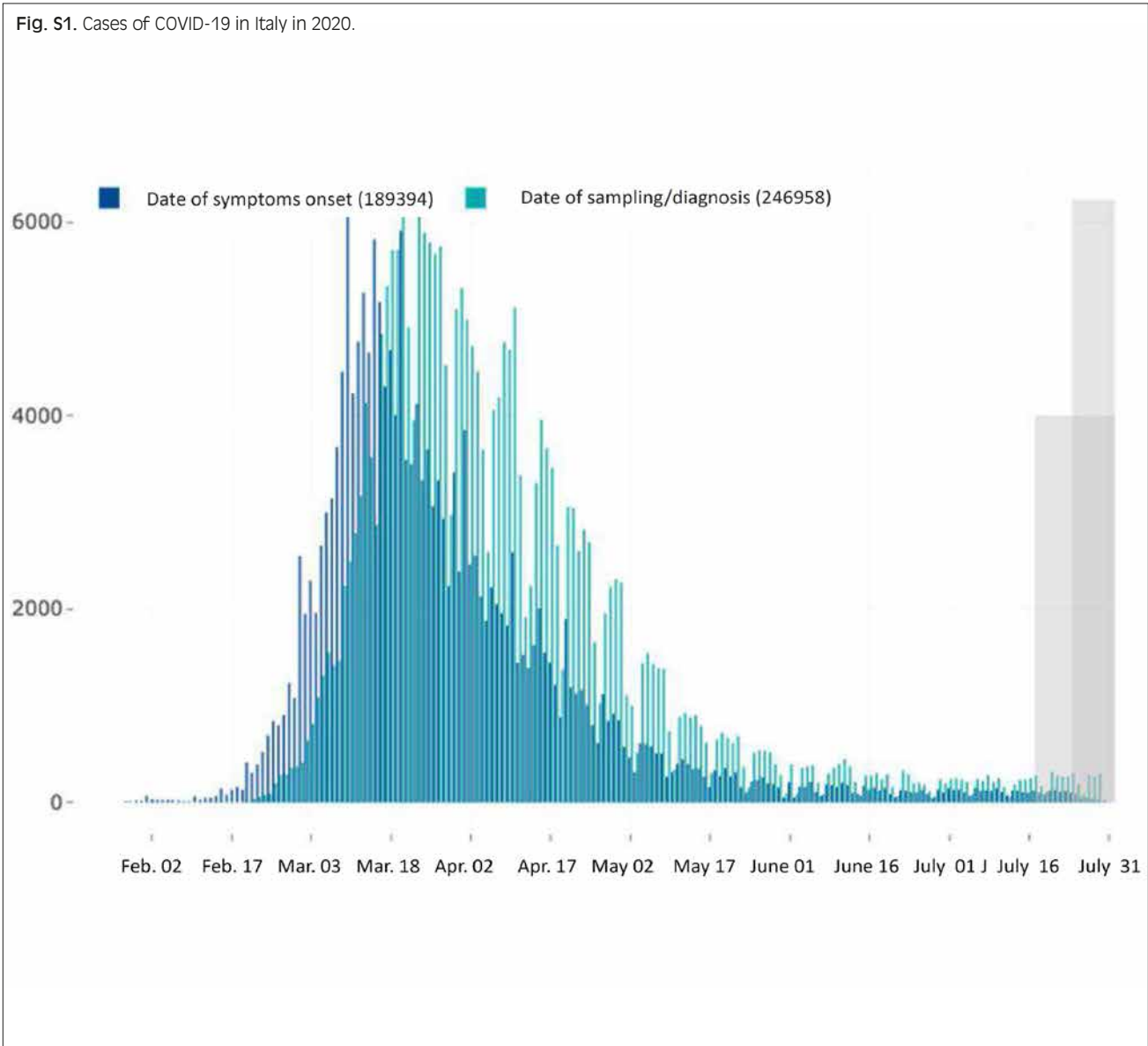


Fig. S2. Cases of COVID-19 in Liguria in 2020.

