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Original Article

Hematology Patient Protection During the COVID-19 Pandemic in Italy: A Nationwide Nursing Survey

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Abstract. ***Background:*** **Italy has been one of the first European countries hit by the COVID-19 pandemic, with many patients dying from severe respiratory issues, especially frail subjects. Hematology patients are generally thought to be at high risk of developing severe COVID-19-associated complications. The aim of this work was to describe the infection control measures adopted in Italian hematology settings to protect patients and health-care professionals.**
Materials and Methods: **On behalf of the Nursing Campus in Hematology Group, a nationwide nursing survey was conducted. Questionnaire items included general information, infection control measures, patient and health-care professional protection, information management, and participants' opinion on critical issues. Data have been analyzed by center location (Northern, Central, or Southern Italy) and by patient age (adult vs pediatric).**
Results: **Forty-four Italian hematology centers participated, representing 52.4% of those invited. Patients underwent nasopharyngeal swabs (93.2%) generally the day before admission (43.2%), though less frequently in Southern centers ($p = 0.0377$). Visitor restrictions were implemented in all centers: 65.9% barred all visitors, while 25.0% allowed visitors only for patients with specific conditions, especially in Central Italy. Deficiency of personal protective equipment, including masks (45.5%) and gloves (22.7%), was reported, although the nurses' opinion was that the emergency was nevertheless well managed to protect patients and professionals. Almost all health-care institutions (97.7%) provided recommendations on emergency management. No significant differences were found between adult and pediatric centers in terms of infection prevention and control.**
Discussion: **Low variability in patient protection strategies was observed, meaning that national recommendations were effective. However, some critical issues emerged regarding the management of infected health-care professionals and their contacts.**

Keywords: COVID-19; SARS-CoV-2; Coronavirus; Infection spread; Hematology; Infection control; Patient safety; Patient Protection; Nursing.

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Introduction. Most individuals infected with the novel coronavirus disease (COVID-19) will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people and those with underlying medical problems, like cardiovascular disease, diabetes, chronic respiratory disease, and cancer, are more likely to develop a serious form of the COVID-19 disease named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2).[1,2,3,4]

In Italy, the number of COVID-19 cases began to increase exponentially in the second half of February 2020.[5] However; it has been hypothesized that the virus was already circulating in the population in late January.[6]

Over the weeks following the initial outbreak, clusters of SARS-CoV-2 infection began to appear in Northern Italy,[7] and many people developed life-threatening conditions that required admission to an intensive care unit (ICU).[8] Despite several actions undertaken by the Italian health authorities, a rapid spread of the virus was observed throughout March, leading the Italian Government to issue strict containment measures to limit individuals' free circulation throughout the country.[9,10,11,12] Considering the number of infected cases and the mortality rate, Italy was initially one of the worst-hit countries in Europe.[13]

Initially, COVID-19 mortality, expressed as fatality rate (FR), was higher in Italy than in other European countries and in China due to various factors, such as demographic aging, screening, and testing strategies, and the definition of death adopted.[6] Examining the cohort of patients who died before March 30, 2020, a higher prevalence was observed in people over age 70 years (FR = 23.8%) and in males (FR 13.3% vs. 7.4%). The presence of comorbidities appears to be associated with mortality, especially among older patients,[14] as documented by previous publications.[15,16,17]

Although there are few and controversial data on COVID-19 patients with malignant hematological conditions,[18,19] it is reasonable to consider them at a high risk of death because they are immunocompromised.[20,21,22,23,24] The Italian Society of Hematology (SIE) and the Italian Group for Bone and Marrow Transplantation (GITMO), the Italian Bone Marrow Donor Registry (IBMDR), the Italian Blood Center (CNS), and the National Italian Transplant Center (CNT) have all published several suggestions and recommendations[25,26,27,28] on how to manage hematological patients in different settings.

However, the practical application of those suggestions and recommendations may have fallen short due to the still limited knowledge of the virus's transmission mechanisms,[29,30] the lack of reliable screening tests and strategies,[15,16] and the high speed of contagion.[31] Hospital departments and wards had very little time to put emergency measures in place to contain the spread of infection. A proactive approach adopting strict isolation precautions as well as surveillance and control strategies appeared to be the best method to prevent the spread of the virus, thereby protecting and ensuring hematology patients' safety.[32,33]

This paper describes the main organizational and contextual issues in Italian hematology units and how they have protected their patients and staff during the COVID-19 pandemic.

The aims of the survey were: a) to explore real-life practices for containing the spread of SARS-CoV-2 in hematology settings; b) to analyze significant differences according to each center's location (Northern, Central, Southern Italy) and patient age (adult, pediatric); c) to investigate nurses' opinions on how well his/ her local health authority managed the crisis.

Materials and Methods. A cross-sectional study was conducted from April 17 to May 8, 2020, on behalf of the Nursing Campus in Hematology (NCH) project, a cooperative network of nurses working in Italy's hematology settings. Data focused on different clinical settings of hematology were previously provided by our organization without concerning nursing issues.[34,35,36,37]

Hematology nurses involved in our group's various activities were invited to participate via email and were provided with a link to the online survey. Participation was voluntary, and consent was assumed upon completion of the questionnaire. Data were collected anonymously. Given the exploratory objectives of the survey, only one questionnaire per center was required.

The questionnaire was developed by the multidisciplinary NCH team composed of hematology nurses, physicians, and research methodologists, who took into account the suggestions provided in the available literature and focused on the major areas of

interest for practice. The questionnaire was tested for clarity and comprehension in 8 centers before the formal start of the study.

The nurse survey consisted of 39 items: 5 investigating details of the hematology center, the remaining 34 covering general information (organization, local epidemiology), infection control measures adopted, patient and Health Care Professionals (HCPs) protection (COVID-19 testing strategies, safety behaviors, etc.), information management, and nurses' perception of infection control management (evaluated with a 10-point Likert scale).

Statistical analysis. The adopted strategy for data analysis was based on the epidemiology items, i.e., the spread of infection throughout the geographical areas (Northern, Central, Southern Italy) and the variable incidence in different age groups (Adult, Pediatric). Clustering analysis was done to explore any behavioural differences due to the virus' spread characteristics and / or timing and the different regional health care organizational systems.

The statistical analysis was performed by Matlab statistical toolbox version 2008 (MathWorks, Natick, MA, USA) for Windows at 32 bites, on a sample of 44 different centres.

Data are presented as numbers and percentages for categorical variables, and continuous data are expressed as the mean ± standard deviation (SD) unless otherwise specified. The χ^2 test and Fisher's exact test were performed to evaluate significant differences in proportions or percentages between groups. A binomial test was performed to compare two mutually exclusive proportions or percentages. The multiple comparison chi-square test was used to define significant differences between percentages for unpaired data; if the chi-square test was positive (p-value less than 0.05), then post-hoc with Z-test was performed to locate the highest or lowest significant presence. Multiple comparison Cochran's Q tests were used to compare the differences between percentages for paired data, considering the null hypothesis that there were no differences between the variables or modalities. When the Cochran's Q test was positive ($p<0.05$), a minimum required difference for a significant difference between two proportions was calculated using the minimum required differences method with Bonferroni p-value corrected for multiple comparisons. One-way ANOVA test was used in multiple comparisons between means; a post-hoc Scheffe test for pairwise comparison of subgroups was performed. The Kolmogorov-Smirnov test was conducted to test normal distribution, with Lilliefors significance correction. When the one-way ANOVA was not adapted (non-normality), the Kruskal-Wallis test was performed to compare three or more independent samples; if the Kruskal-Wallis test was significant (p-value < 0.05), the post-hoc Dunn test for pairwise comparison of subgroups was performed. The Mann-Whitney test, the alternative to the independent samples t-test when the samples' distribution is non-normal, was used to test the significance of the difference between two independent samples. All tests with p-value (p) <0.05 were considered significant.

Results. Eighty-four hematology centers were invited to complete the survey; 44 centers (52.4%) completed the survey, 26 of which (59.1%) were in the North of Italy (NIT), 6 (13.6%) in the Center of Italy (CIT), and 12 (27.3%) in the South of Italy and Islands (SITI).

Thirty-one centers (70.4%) provide care to adult patients, 7 (15.9%) to pediatric patients, and 6 (13.6%) to both pediatric and adult patients. Only two adult centers (1 in the North and 1 in the South) did not perform stem cell transplants.

As is known, the SARS-CoV-2 virus has spread throughout Italy, starting from the North to the South, with different characteristics of severity.[38] Furthermore, the incidence and severity of clinical manifestations in adult and pediatric patients appear to differ.[39,40] We performed our analysis assuming differences in patient protection strategies by geographic area and patient age.

First, three groups corresponding to the three macro areas of Italy (North, Central, and South and Islands) were considered. **Table 1** summarizes the survey items, answer frequencies, and univariate and multivariate analyses both in and between groups of each item. The participating centers were then grouped as follows: adult patients (AP) centers, pediatric centers, and those who treat both adults and pediatrics (PAP). Results are shown in **Table 2 (Supplementary materials)**.

General information. Almost all the participating hematology centers (**Table 3 supplementary materials**) were located in hospitals with a dedicated COVID-19 ward (96.1%, 100%, and 83.3% in NIT, CIT, SITI, respectively). Hematology patients positive to SARS-CoV-2 were generally admitted in these wards (90.9%), with no differences between groups. Many hospitals organized COVID-19 pre-triage pathways (77.3%) performed by physicians and/or nurses in order to filter patients' access at hospital gates. These pre-triage pathways were less present in NIT (65.4%) than in CIT (100%) and SITI (91.7%), although the differences were not statistically significant (p=0.072). Body temperature, respiratory frequency, and oxygen saturation measurements, and rapid diagnostic tests for COVID-19 were included in these pathways.

Infection control measures. The number of beds was reduced in 22.7% of hematology centers, with no statistically significant difference between groups. Three centers stopped stem cell transplant activity.

The proportion of hematology wards who have had COVID-19-positive patients differed between

Table 1. Geographic areas: univariate and multivariate analyses in and between subgroups.

Items and answers	Total	Northern Italy (NIT)	Central Italy (CIT)	Southern Italy and Islands (SITI)	Statistical analysis between subgroups
	% (Nr)	% (Nr)	% (Nr)	% (Nr)	p values
	100 (44)	59.1 (26)	13.6 (6)	27.3(12)	
Type of patient cared for					
A – Pediatric	15.9 (7)	23.1 (6)	16.7 (1)	0.0 (0)	p=0.20 (Cm)
B – Adult	70.5 (31)	65.4 (17)	50.0 (3)	91.7 (11)	p=0.13 (Cm)
C – Both	13.6 (6)	11.5 (3)	33.3 (2)	8.3 (1)	p=0.31 (Cm)
		p=0.0019* (Cm) Answer B**, p=0.0078 (Z) Answer C ***, p=0.0362 (Z)	p=0.61 (Cm)	p<0.0001* (Cm) Answer A***, p=0.0244 (Z) Answer B**, p=0.0012 (Z)	
1. In your hospital, are there wards reserved for COVID-19 patients?					
A - Yes	93.2 (41)	96.1 (25)	100 (6)	83.3 (10)	p=0.27 (Cm)
B - No	6.8 (3)	3.9 (1)	0.0 (0)	16.7 (2)	—
		Answer A**, p<0.0001 (B)	Answer A**, p=0.0156 (B)	Answer A**, p=0.0225 (B)	
2. In your center, is there a stem cell transplantation unit?					
A - Yes	95.5 (42)	96.1 (25)	100.0 (6)	91.7 (11)	p=0.70 (Cm)
B - No	4.5 (2)	3.9 (1)	0.0 (0)	8.3(1)	—
		Answer A**, p<0.0001 (B)	Answer A**, p=0.0156 (B)	Answer A**, p=0.0034 (B)	
3. In your center, were the number of beds reduced during the COVID-19 pandemic?					
A - Yes	22.7 (10)	19.2 (5)	33.3 (2)	25.0 (3)	p=0.74 (Cm)
B - No	68.2 (30)	69.2 (18)	50.0 (3)	75.0 (9)	p=0.55 (Cm)
C - Other	9.1 (4)	11.5 (3)	16.7 (1)	0.0 (0)	p=0.41 (Cm)
		p=0.0005* (Cm) Answer B**, p=0.0027 (Z) Answer C ***, p=0.0362 (Z)	p=0.61 (Cm)	p=0.0052* (Cm) Answer B**, p=0.0244 (Z) Answer C ***, p=0.0244 (Z)	
4. In your center, did you have any COVID-19-positive patients? (swab or serology or rapid test positivity)					
A - Yes	43.2 (19)	46.2 (12)	83.3 (5)	16.7 (2)	p=0.0238 * (Cm) no significant post-hoc test
B - No	56.8 (25)	53.8 (14)	16.7 (1)	83.3 (10)	—
		p=0.70 (B)	p=0.125 (B)	Answer B**, p=0.0225 (B)	
5. In your center, did you have any patients with signs or symptoms associated with COVID-19?					
A - Yes	31.8 (14)	30.8 (8)	83.3 (5)	8.3 (1)	p=0.0055 * (Cm)

					CIT **, p=0.0118 (Z)
B - No	68.2 (30)	69.2 (18) p=0.052 (B)	16.7 (1) p=0.125 (B)	91.7 (11) Answer B**, p=0.0034 (B)	—
6. In your hospital, was there a separate pre-triage area for patients with COVID-19 signs or symptoms?					
A - Yes	77.3 (34)	65.4 (17)	100.0 (6)	91.7 (11)	p=0.072 (Cm)
B - No	22.7 (10)	34.6 (9) p=0.12 (B)	0.0 (0) Answer A**, p=0.0156 (B)	8.3 (1) Answer A**, p=0.0034 (B)	—
7. Who worked in the triage area?					
A - Nurses only	43.2 (19)	46.2 (12)	50.0 (3)	33.3 (4)	p=0.71 (Cm)
B - Nurses and Doctors	56.8 (25)	53.8 (14) p=0.70 (B)	50.0 (3) p=1.0 (B)	66.7 (8) p=0.27 (B)	—
8.Which tests were performed in the triage area?					
A - Body temperature only	15.9 (7)	19.2 (5)	0.0 (0)	16.7(2)	p=0.51 (Cm)
B - Body temperature with additional tests	84.1 (37)	80.8 (21) Answer B**, p=0.0015 (B)	100.0 (6) Answer B**, p=0.0156 (B)	83.3 (10) Answer B**, p=0.0225 (B)	—
9. Were nasopharyngeal swab tests performed before patient admission?					
A - Yes	93.2 (41)	96.2 (25)	83.3 (5)	91.7 (11)	p=0.52 (C)
B - Only for patients with signs/symptoms	4.5 (2)	3.8 (1)	16.7 (1)	0.0 (0)	p=0.27 (C)
C - Other (Type of treatment)	2.3 (1)	0.0 (0) p<0.0001* (C) Answer A**, p<0.0001 (Z) Answer B***, p=0.0055 (Z) Answer C ***, p=0.0018 (Z)	0.0 (0) p=0.0302* (C) no significant post hoc test	8.3 (1) p<0.0001* (C) Answer A**, p=0.0012 (Z) Answer B***, p=0.0244 (Z)	p=0.26 (C)
10. If so, when were they tested?					
A - The day before admission	43.2 (19)	53.8 (14)	66.7 (4)	8.3 (1)	0.0143 * (Cm) SITI ***, p=0.0377 (Z)
B - Some days before admission	29.5 (13)	26.9 (7)	0.0 (0)	50.0 (6)	p=0.082 (Cm)
C - Before and repeated at admission	11.4 (5)	15.4 (4)	16.7 (1)	0.0 (0)	p=0.35 (Cm)
D - At admission	13.6 (6)	3.8 (1)	16.7 (1)	33.3 (4)	p=0.047 * (Cm) no significant post-hoc test
E - Some days before and then repeated the day before admission	2.3 (1)	0.0 (0) p<0.0001* (Cm) Answer A**, p=0.0003 (Z) Answer D***, p=0.0393 (Z) Answer E ***, p=0.0124 (Z)	0.0 (0) p=0.061 (Cm)	8.3 (1) p=0.0328* (Cm) Answer B**, p=0.0454 (Z)	p=0.26 (Cm)

11. When did you receive the tests results after nasopharyngeal swab?					
A - Within 12 hours	45.5 (20)	57.7 (15)	16.7 (1)	33.3 (4)	p=0.12 (Cm)
B - From 12 to 24 hours	45.5 (20)	38.5 (10)	66.7 (4)	50.0 (6)	p=0.43 (Cm)
C - After 24 hours	9.0 (4)	3.8 (1)	16.7 (1)	16.7 (2)	p=0.35 (Cm)
		p=0.0030* (Cm) Answer A**, p=0.0475 (Z) Answer C***, p=0.0055 (Z)	p=0.22 (Cm)	p=0.37 (Cm)	
12. Where were COVID-19-positive hematology patients needing hospitalization admitted?					
A - In a COVID-19 ward	90.9 (40)	88.5 (23)	100.0 (6)	91.7 (11)	p=0.67 (Cm)
B – In hematology ward	4.5 (2)	3.8 (1)	0.0 (0)	8.3 (1)	p=0.70 (Cm)
C - Other: medical-oncological ward	4.5 (2)	7.7 (2)	0.0 (0)	0.0 (0)	p=0.48 (Cm)
		p<0.0001* (Cm) Answer A**, p<0.0001 (Z) Answer B***, p=0.0055 (Z) Answer C***, p=0.0149 (Z)	p=0.0025* (Cm) Answer A**, p=0.0133 (Z)	p<0.0001* (Cm) Answer A**, p=0.0012 (Z) Answer C***, p=0.0244 (Z)	
13. Were more restrictive measures for visitor access to the hematology ward taken to prevent the spread of infection?					
A - Yes	100 (44)	100 (26)	100 (6)	100 (12)	P=1.0 (Cm)
B - No	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	—
		Answer A**, p<0.0001 (B)	Answer A**, p=0.0156 (B)	Answer A**, p=0.0002 (B)	
14. If so, what measures were taken?					
A - Visitors were not allowed	65.9 (29)	76.9 (20)	33.3 (2)	58.3 (7)	p=0.10 (C)
B - Only visitors of patients with particular clinical conditions were allowed	25.0 (11)	19.2 (5)	66.7 (4)	16.7 (2)	p=0.0395 * (C) CIT, **, p=0.0395 (Z)
C - Visitors of patients in particular clinical conditions were allowed, though for a reduced time	9.1 (4)	3.8 (1)	0.0 (0)	25 (3)	p=0.077 (Cm)
		p<0.0001* (Cm) Answer A**, p=0.0002 (Z) Answer C***, p=0.0055 (Z)	p=0.14 (Cm)	p=0.17 (Cm)	
15. Were screening tests for healthcare professionals performed?					
A – Yes	79.5 (35)	76.9 (20)	83.3 (5)	83.3 (10)	p=0.87 (Cm)
B – No	20.5 (9)	23.1 (6)	16.7 (1)	16.7 (2)	—
		Answer A**, p=0.0059 (B)	p=0.125 (B)	Answer A**, p=0.0225 (B)	
16. Which screening tests were performed?					
A - Not applicable (No to question 15)	20.5 (9)	23.1 (6)	16.7 (1)	16.7 (2)	p=0.87 (Cm)
B - Nasopharyngeal swab	22.7 (10)	23.1 (6)	33.3 (2)	16.7 (2)	p=0.73 (Cm)
C - Blood tests (blood samples or rapid tests)	9.1 (4)	11.5 (3)	0.0 (0)	8.3 (1)	p=0.80 (Cm)

D – Both	47.7 (21)	42.3 (11) p=0.17 (Cm)	50.0 (3) p=0.34 (Cm)	58.3 (7) p=0.062 (Cm)	p=0.65 (Cm)
17. Were the tests routinely repeated?					
A - Yes	68.2 (30)	73.1 (19)	66.7 (4)	58.3 (7)	p=0.86 (Cm)
B – No	11.4 (5)	3.8 (1)	16.7 (1)	25.0 (3)	p=0.15 (Cm)
C - Not applicable (No to question 15)	20.4 (9)	23.1 (6)	16.7 (1)	16.7 (2)	p=0.87 (Cm)
		p<0.0001* (Cm) Answer A**, p=0.0008 (Z) Answer B***, p=0.0055 (Z)	p=0.22 (Cm)	p=0.17 (Cm)	
18. Please describe characteristics of screening					
A – Structured screening	65.9 (29)	65.4 (17)	66.7 (4)	66.7 (8)	p=1.00 (Cm)
B – one-off test	9.1 (4)	7.7 (2)	16.7 (1)	8.3 (1)	p=0.78 (Cm)
C - No test	18.2 (8)	19.2 (5)	16.7 (1)	16.7 (2)	p=0.98 (Cm)
D - Not specified	6.8 (3)	7.7 (2)	0.0 (0)	8.3 (1)	p=0.77 (Cm)
		p<0.0001* (Cm) Answer A**, p<0.0001 (Z) Answer B***, p=0.0499 (Z) Answer D***, p=0.0499 (Z)	p=0.11 (Cm)	p=0.0101* (Cm) Answer A**, p=0.0094 (Z)	
19. Were any healthcare professionals COVID-19-positive?					
A – Yes	47.7 (21)	57.7 (15)	66.7 (4)	16.7 (2)	p=0.0380 * (Cm) no significant post-hoc test
B – No	52.3 (23)	42.3 (11)	33.3 (2)	83.3 (10)	—
		p=0.44 (B)	p=0.45 (B)	Answer B**, p=0.0225 (B)	
20. Were the COVID-19-positive healthcare professionals in self-isolation?					
A - Yes	100.0 (44)	100.0 (26)	100.0 (6)	100.0 (12)	p=1.00 (Cm)
B - No	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	—
		Answer A**, p<0.0001 (B)	Answer A**, p=0.0156 (B)	Answer A**, p<0.0001 (B)	
21. Please specify how the healthcare professionals or patients who had contact with COVID-19-positive healthcare professionals/patients were managed					
A - Alerting competent authorities	15.9 (7)	23.1 (6)	16.7 (1)	0.0 (0)	p=0.19 (Cm)
B - Education	2.3 (1)	0.0 (0)	16.7 (1)	0.0 (0)	p=0.0392 * (Cm) CIT, ** , p=0.0279 (Z)
C - Screening tests	40.9 (18)	46.2 (12)	16.7 (1)	41.7 (5)	p=0.42 (Cm)
D - Not managed	20.4 (9)	19.2 (5)	33.3 (2)	16.7 (2)	p=0.69 (Cm)
E – Not specified/unknown	18.2 (8)	11.5 (3)	16.7 (1)	33.3 (4)	p=0.27 (Cm)
F – PPE	2.3 (1)	0.0 (0)	0.0 (0)	8.3 (1)	p=0.26 (Cm)
		p=0.0003* (Cm)	p=0.85 (Cm)	p=0.052 (Cm)	

		Answer C**, p=0.0006 (Z) Answer B***, p=0.0202(Z) Answer F***, p=0.0202(Z)			
22. Did self-isolated COVID-19-positive healthcare professionals repeat the nasopharyngeal swab before returning to work?					
A - Yes	93.2(41)	96.2 (25)	100.0 (6)	83.3 (10)	p=0.27 (Cm)
B - No	6.8 (3)	3.8 (1)	0.0 (0)	16.7 (2)	—
		Answer A**, p<0.0001 (B)	Answer A**, p=0.0156 (B)	Answer A**, p=0.0225 (B)	
23. What personal protective equipment (PPE) was used during daily care of (COVID-19-negative) hematology patients?					
A - Surgical mask	86.4 (38)	88.5 (23)	100.0 (6)	75.0 (9)	p=0.31 (Cm)
B - FFP2	27.3 (12)	19.2 (5)	33.3 (2)	41.7 (5)	p=0.33 (Cm)
C - FFP3	2.3 (1)	3.8 (1)	0.0 (0)	0.0 (0)	p=0.70 (Cm)
D - TNT gown	36.4 (16)	23.1 (6)	50.0 (3)	58.3 (7)	p=0.08 (Cm)
E - Water-resistant gown	22.7 (10)	23.1 (6)	33.3 (2)	16.7 (2)	p=0.73 (Cm)
F - Full suit	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	p=1.00 (Cm)
G - Visor	11.4 (5)	11.5 (3)	16.7 (1)	8.3 (1)	p=0.87 (Cm)
H - Safety glasses	25.0 (11)	26.9 (7)	16.7 (1)	25.0 (3)	p=0.87 (Cm)
I - Both visor/glasses	15.9 (7)	7.7 (2)	33.3 (2)	25.0 (3)	p=0.18 (Cm)
		p<0.001* (Q) Answer A**, p<0.05 (MRD)	p=0.008* (Q) Answer A>C*, p<0.05 (MRD) Answer A>F*, p<0.05 (MRD)	p<0.001* (Q) Answer A>C *, p<0.05 (MRD) Answer A>F *, p<0.05 (MRD) Answer A>G *, p<0.05 (MRD)	
24. Were masks lacking during the acute phase of COVID-19?					
A - Yes	45.5 (20)	43.3 (11)	50.0 (3)	50.0 (6)	p=0.88 (Cm)
B - No	54.5 (24)	57.7 (15)	50.0 (3)	50.0 (6)	—
		p=0.44 (B)	p=1.0 (B)	p=1.0 (B)	
25. Were any other PPEs lacking?					
A – No	43.2 (19)	43.3 (11)	50.0 (3)	41.7 (5)	p=0.94 (Cm)
B - Gowns	45.5 (20)	46.1 (12)	33.3 (2)	50.0 (6)	p=0.79 (Cm)
C - Safety glasses/Visors	34.1 (15)	34.6 (9)	33.3 (2)	33.3 (4)	p=1.00 (Cm)
D – Gloves	22.7 (10)	19.2 (5)	0.0 (0)	41.7 (5)	p=0.11 (Cm)
E - Other (shoe cover, cap)	4.5 (2)	3.8 (1)	0.0(0)	8.3 (1)	p=0.70 (Cm)
		p=0.009* (Q) Answer A>E*, p<0.05 (MRD) Answer B>E*, p<0.05 (MRD)	p=0.24 (Q)	p=0.24 (Q)	
26. When were masks worn?					

A - Only in patients' rooms or during patient care	4.5 (2)	0.0 (0)	0.0 (0)	16.7 (2)	p=0.06 (Cm)
B - Everywhere and all the time in the ward/hospital	95.5 (42)	100.0 (26)	100.0 (6)	83.3 (10)	p=0.06 (Cm)
C - Other	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	p=1.00 (Cm)
		p<0.0001* (Cm) Answer B**, p<0.0001 (Z) Answer A***, p=0.0018 (Z) Answer C***, p=0.0018 (Z)	p=0.0025* (Cm) Answer B**, p=0.0133 (Z)	p=0.0009* (Cm) Answer B**, p=0.0060 (Z) Answer C***, p=0.0244(Z)	
27. How often were masks changed?					
A - At every shift	29.5 (13)	3.8 (1)	66.7 (4)	66.7 (8)	p<0.0001* (Cm) SITI **, p=0.0162 (Z)
B – Regularly, according to manufacturer's instructions	43.2 (19)	57.7 (15)	16.7 (1)	25.0 (3)	p=0.06 (Cm)
C - Other	27.3 (12)	38.5 (10)	16.7 (1)	8.3 (1)	p=0.13 (Cm)
		p=0.0030* (Cm) Answer B**, p=0.0475 (Z) Answer A***, p=0.0055 (Z)	p=0.22 (Cm)	p=0.0388* (Cm) No significant post hoc test	
28. Was access to any work environment limited during daily practice? (e.g., not over 2 HCPs in the same room, if not needed)					
A - Yes	61.4 (27)	69.2 (18)	50.0 (3)	50.0 (6)	p=0.44 (Cm)
B - No	13.6 (6)	15.4 (4)	0.0 (0)	16.7 (2)	p=0.57 (Cm)
C - No, but instruction on safety distance was provided	25.0 (11)	15.4 (4)	50.0 (3)	33.3 (4)	p=0.16 (Cm)
D - Other	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	p=1.00 (Cm)
		p=0.13 (Cm)	p=0.11 (Cm)	p=0.083 (Cm)	
29. Did your hospital/department provide any official recommendations or directives on COVID-19 emergency management?					
A - Yes	97.7 (43)	100.0 (26)	83.3 (5)	100.0 (12)	p=0.0392* (Cm) CIT, ***, p=0.0279 (Z)
B - No	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	p=1.00 (Cm)
C - Other	2.3 (1)	0.0 (0)	16.7 (1)	0.0 (0)	p=0.0392* (Cm) CIT, **, p=0.0279 (Z)
		p<0.0001* (Cm) Answer A**, p<0.0001 (Z) Answer B***, p=0.0018 (Z) Answer C***, p=0.0018 (Z)	p=0.0302* (Cm) No significant post-hoc test	p<0.0001* (Cm) Answer A**, p=0.0002 (Z) Answer B***, p=0.00244 (Z) Answer C***, p=0.00244(Z)	
30. Which areas did these recommendations/directives cover?					
A - Patient management	100.0 (44)	100.0 (26)	100.0 (6)	100.0 (12)	p=1.00 (Cm)
B - Access Management (visitors)	93.2 (41)	92.3 (24)	83.3 (5)	100.0 (12)	p=0.40 (Cm)
C - Personal protective equipment (PPE) management	95.5 (42)	100.0 (26)	100.0 (6)	83.3 (10)	p=0.06 (Cm)
D - Infection control of workers	100.0 (44)	88.5 (23)	50.0 (3)	66.7 (8)	p=0.08 (Cm)
E – Other	11.4 (5)	7.7 (2)	16.7 (1)	16.7 (2)	p=0.65 (Cm)

		p<0.001* (Q) Answer E***, p<0.05 (MRD)	p=0.009* (Q) Answer E***, p<0.05 (MRD)	p<0.001* (Q) Answer E***, p<0.05 (MRD)	
31. Did your hospital/department provide any recommendations/instructions to patients and their familiars to prevent contagion?					
A - Yes	63.6 (28)	73.1 (19)	66.7 (4)	41.7 (5)	p=0.17 (Cm)
B - No	22.7 (10)	19.2 (5)	16.7 (1)	33.3 (4)	p=0.58 (Cm)
C - I don't know	13.6 (6)	7.7 (2)	16.7 (1)	25.0 (3)	p=0.34 (Cm)
		p<0.0001* (Cm) Answer A**, p=0.0008 (Z) Answer C***, p=0.0149 (Z)	p=0.22 (Cm)	p=0.79 (Cm)	
32. Did your center provide any specific recommendations or instructions to hematology patients?					
A - Yes	50.0 (22)	61.6 (16)	33.3 (2)	33.3 (4)	p=0.18 (Cm)
B - No	43.2 (19)	34.6 (9)	66.7 (4)	50.0 (6)	p=0.31 (Cm)
C - I don't know	6.8 (3)	3.8 (1)	0.0 (0)	16.7 (2)	p=0.27 (Cm)
		p=0.0015* (Cm) Answer A**, p=0.0203 (Z) Answer C***, p=0.0055 (Z)	p=0.14 (Cm)	p=0.37 (Cm)	
33. In your hospital, how was information provided and managed?					
A - Emails received at institutional email address	77.3 (34)	80.8 (21)	83.3 (5)	66.7 (8)	p=0.58 (Cm)
B – Through an app	6.8 (3)	7.7 (2)	0.0 (0)	8.3 (1)	p=0.77 (Cm)
C - Hospital intranet	75.0 (33)	92.3 (24)	50.0 (3)	50.0 (6)	p=0.0062 * (Cm) SITI ***, p=0.0466 (Z)
D – In the ward from head nurses or medical directors	13.6 (6)	11.5 (3)	0.0 (0)	25.0 (3)	p=0.31 (Cm)
E - Word of mouth	6.8 (3)	3.8 (1)	33.3 (2)	0.0 (0)	p=0.0195 * (Cm) no significant post-hoc test
F - Other	6.8 (3)	11.5 (3)	0.0 (0)	0.0 (0)	p=0.31 (Cm)
		p<0.001* (Q) Answer A**, p<0.05 (MRD) Answer C**, p<0.05 (MRD) Answer B***, p<0.05 (MRD) Answer D***, p<0.05 (MRD) Answer E***, p<0.05 (MRD) Answer F***, p<0.05 (MRD)	p=0.009* (Q) Answer A>B*, p<0.05 (MRD) Answer A>D*, p<0.05 (MRD) Answer A>F*, p<0.05 (MRD)	p=0.001* (Q) Answer A>B*, p<0.05, (MRD) Answer A>E*, p<0.05 (MRD) Answer A>F*, p<0.05 (MRD)	
34. What is your personal opinion on how the following issues were managed by your hospital/institution? +					
A – availability of PPEs		mean ±SD = 7.2±2.3 median = 8 median 95% CI =6.5-8 KS: p=0.0002 (rN)	mean ±SD = 7.5±2.2 median = 8 median 95% CI =5-9.8 KS: p>0.10 (aN)	mean ±SD = 6.3±1.7 median = 6.5 median 95% CI=5.2-7 KS: p>0.10 (aN)	p=0.21 (KW) reject Normality(KS), p>0.05
B - Patient protection		mean ±SD = 7.4±2.3 median = 8	mean ±SD = 7±2.6 median = 7.5	mean ±SD = 6.8±1.6 median = 7	p=0.44 (KW)

	median 95% CI =7-9 KS: p=0.0237 (rN)	median 95% CI =3.4-9.8 KS: p>0.10 (aN)	median 95% CI=6-8 KS: p>0.10 (aN)	reject Normality(KS), p>0.05
C – HCP protection	mean ±SD = 6.6±2.7 median = 7 median 95% CI =5-8 KS: p>0.10 (aN)	mean ±SD = 6.2±2.6 median = 6.5 median 95% CI =2.6-9.4 KS: p>0.10 (aN)	mean ±SD = 6.5±1.9 median = 6 median 95% CI =6-8 KS: p=0.076 (aN)	p=0.89 (KW) reject Normality(KS), p>0.05
D – Quality of communication (rapidity, clarity)	mean ±SD = 6.7±2.7 median = 7.5 median 95% CI =5.5-8 KS: p=0.0065 (rN)	mean ±SD = 6.7±3.1 median = 8 median95% CI=1.8-9 KS: p=0.0386 (rN)	mean ±SD = 6.4±2.5 median = 6 median 95% CI =5-9 KS: p>0.10 (aN)	p=0.94 (KW) reject Normality(KS), p>0.05

+ = 10-point Likert scale where 1 means “in the worst manner” and 10 means “in the best manner” KS= Kolmogorov-Smirnov test for Normal distribution p=p-value	*=significant test (p<0.05) ** =significant most frequent ***=significant low frequent Z=Z-test	Cm=multiple chi square test B=Binomial test (rN) = reject Normality (aN)=accept Normality	KW= Kruskal-Wallis test D=Dunn test for pairwise comparison F= Fisher's exact test — = equal to previous result	MRD= minimum required differences method with Bonferroni p-value corrected

geographic groups (46.2% in NIT vs. 83.3% in CIT vs. 16.7% in SITI centers); PAP centers with COVID-19-positive cases were significantly more (p = 0.0239). In addition, CIT had a higher percentage of centers reporting patients with COVID-19 clinical signs or symptoms (83.3%; p=0.0118) without laboratory confirmation.

Almost all centers (93.2%) performed swab tests before patient admission: the day before admission in 43.2% of centers, more frequently in NIT and CIT centers (53.8% and 66.7%, respectively), less frequently in SITI centers (8.3%, p = 0.0377). Both AP and PAP centers performed swabs the day before admission (41.9% and 46.2%), or, less frequently, some days before (35.4% and 15.4%). The test results were available within 12 hours (45.5%) or between 12 to 24 hours (45.5%) or after 24 hours (9.0%). Protective measures were locally adopted: limiting access to the hematology wards (100%), not allowing visitors in 65.9% of centers (especially but not significantly in NIT centers, p = 0.10). CIT centers preferred to allow visitors based on the patient's clinical condition (66.7%), differing significantly from the other geographic areas (p = 0.0395). COVID-19 testing was performed on HCPs in 79.5% of centers, most commonly with both nasopharyngeal swab and blood tests (47.7%); tests were repeated routinely in 68.2% of centers. There were no statistical differences by geographical area or type of patient assisted.

Patient and health care professional protection. Personal protective equipment (PPEs) are routinely used in the hematology setting during patient care. Surgical masks (86.4%), TNT gowns (36.4%), and safety glasses (25.0%) were the first choices. HCPs wore masks at all times, whether during patient care or not (95.5%), especially in NIT (100%) and CIT (100%) than SITI centers (83.3%; p = 0.06); masks were changed at every shift, especially in SITI centers (66.7%, p = 0.0162), while they were more frequently changed according to manufacturer's instructions in NIT centers (57.7%), without any significant differences (p = 0.06).

A shortage of PPEs during the initial phase of the COVID-19 pandemic in Italy was observed: 45.5% of centers reported a lack of masks, while 43.2% reported there was no problem with PPE availability (gowns, visors, safety glasses, gloves, etc.). There were no differences between groups except for lack of gloves in AP centers than the PAP ones (p = 0.0239).

Regarding infected HCPs, there was a significant difference among the three geographic areas (p = 0.0380). In particular, Northern and Central Italy had more centers with diagnosed cases among HCPs (57.7% and 66.7%, respectively); home isolation (varying from 10 days to 5-6 weeks) and various strategies of readmission to work (after 1 to 3 negative swab tests, or after symptom resolution, without a test) were adopted. Swab test negativity was required before work readmission in 93.2% of centers. The management of patients and HCPs who had contact with COVID-19-positive individuals was based on alerting the competent authorities and performing diagnostic tests (56.8%). However, in 38.6% of centers, this issue was not managed or not specified/unknown. In Northern Italy, management's first choice was performing a diagnostic test (46.2%; p = 0.0003). Other infection control strategies were reported; for example, limiting access to the work environment (e.g., no more than 2 HCPs in a patient room if not needed) was adopted by 61.4% of centers, and 25.0% provided only safety distance norms.

Information management. All centers referred to the official instructions or recommendations for situation management provided by their local institutions (hospital/department directives); only one center in the CIT group reported a delay in receiving any instructions. These recommendations mainly concerned "patient management" (100%), "access management" (92.3%, 83.3%, and 100% in NIT, CIT, and SITI, respectively), "PPE management" (100% in NIT and CIT, 83.3% SITI), and "infection protection of HCPs" (88.5%, 50.0%, 66.7%, respectively). Instructions for patients and families aimed at preventing the spread of the virus were provided by local health authorities, mainly in NIT (73.1%), but with no significant differences between the three areas. Hematology units provided specific recommendations for hematology patients and their relatives in 61.6% of NIT centers and in 33.3% of both CIT and SITI centers.

A significant difference was seen in the modality of providing updated information. The majority of centers provided updated information in real-time through the official institutional email service (80.8%, 83.3%, and 66.7% in NIT, CIT, and SITI, respectively) and the local hospital intranet (92.3%, 50.0%, and 50.0%), especially in NIT centers (p = 0.0062). Information transmission by word of mouth was significantly adopted in CIT centers (p = 0.0195).

Nurses' perception. Responders' subjective opinion on PPE availability, patient protection, HCP protection, and communication quality was generally better in NIT centers than in CIT and SITI centers. However, there were no significant differences between groups.

Discussion. Our work suggests that local health institutions approached the problem in agreement with Italian health authorities' recommendations and Government laws, without any significant differences between geographic areas or type of patients cared for. More restrictive measures on outpatient and visitor accesses, for example, not allowing visitors any access

at all or only in particular cases, were adopted in all centers. In pediatric centers, one parent or caregiver was always permitted. A reduction in beds was applied in a few centers while maintaining the recommended routine activity on malignant diseases.[24,25]

However, differences in specific issues and some critical aspects emerged. There were fewer hematology centers with COVID-19-positive patients in Southern regions, in accordance with the lower incidence of the infection. CIT centers reported higher percentages of COVID-19-positive patients, but the low number of collected answers from this area is likely to be a confounding factor. Considering the virus' aggressiveness, hematology patients' immunocompromised status, and the severity of the pandemic, especially in Northern Italy, the number of hematology centers with no SARS-CoV-2-positive patients suggest that safety procedures were applied and adhered to. Fewer pre-triage zones were organized in the NIT hospitals than in the other geographic groups. However, this did not seem to affect the infection's spread, probably due to other strategies adopted such as remote working or screening procedures. In addition, at the time this survey was conducted, the severity of the pandemic in the Northern regions may have delayed the implementation of some containment measures.[41]

Patients admitted to hematology wards were tested before or at admission and were considered infected and thus isolated until test results were available, as required by the SIE/GITMO and EBMT recommendations;[24,25] almost all centers were in line with the recommendations. However, in this context, a laboratory response time of more than 12 hours for swab tests does not appear appropriate.

Different strategies were adopted regarding the management of infected HCPs and their contacts. Rapid identification and isolation of infected subjects as well as contact tracing appear to be crucial,[42,43,44] although there are still some unresolved issues, such as the management of the return to work of previously infected HCPs. The timing of viral shedding after symptom onset in infected subjects appears variable and likely depends on many factors, including the host's immunological features, the severity of illness, and viral load.[45,46] A limited number of centers based on their approach to patient and HCP safety on a time frame only, reporting that COVID-19 positive HCPs returned to work without performing any further tests. This approach appeared incautious, given what has been stated above and the variability in readmission timing as reported by the centers in this survey.

Significant difficulties were registered in managing both patients and HCPs who have had contact with COVID-19-positive patients or HCPs. Tracing and managing contacts should be considered one of the critical measures to contain the spread of SARS-CoV-2 infection.[43,44] Our results showed that screening tests were performed in just over a third of hematology centers on this population of contacts and that compliance with alerting the competent authorities of these exposed contacts was scarce.

The lack of PPEs, including face masks and gloves, was reported in the survey. The lockdown measures adopted affected the circulation of materials and commerce, resulting in supply problems. International guidelines have recommended both extensive adoption of at least standard precautions and optimizing the use of PPEs in order to ensure their availability;[43,44,47] strategies to make more efficient use of PPEs may have been perceived as a lack of them, especially by HCPs working in hematology settings, where PPEs are commonly used.

HCPs in almost all hospitals were provided with recommendations and directives on patient management, visitor access, PPEs, and infection prevention and control among workers. However, specific recommendations for hematology patients and their families on preventing the spread of the virus and aimed to reduce misinformation exposure 48 were less frequently available. As hematology HCPs apply infection control measures in their daily practice, this may have allowed them to contain the spread of the virus in their setting more effectively. The strategies described by almost all centers, such as the maximum length of time a mask could be worn, the surgical masks as the first choice, and applying strict measures to limit environmental contact between HCPs, may be considered a reasonable translation of recommended measures into practice.

Our study has some limitations. As the sample represents just over half of the invited centers, the results cannot, therefore, be said to represent all hematology centers in Italy. Some specific issues, such as HCPs exposure without PPEs, home isolation follow-up practices, environmental hygiene practices, and waste management, were not investigated. The survey provided insight into practices put in place during the acute phase of the COVID-19 pandemic (lockdown), and qualitative feedback assessed issues felt to be pertinent to nursing. However, this research methodology does not provide an in-depth understanding of these issues. Qualitative research could be conducted to complement this investigation. However, substantial compliance of Italian hematology centers with National health authorities' recommendations and Government laws to control the spread of SARS-CoV-2 was observed, and hematology HCPs' skills in infection control may have contributed to having many COVID-19-free hematology centers. Our data do not allow us to evaluate the impact of acted measures on patients' outcomes or on the epidemic.[48,49] However, they could provide gained information on what occurred in our hematology ward during the COVID-19 pandemic, such as activities limitation,

variability in swab practices, reduced PPEs availability as well as outpatients, visitors, and contacts management. Our findings could be useful to face a better further round of infection.

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Supplementary data.

Table 2. Type of patients cared: univariate and multivariate analyses in and between subgroups.

Items and answers	Adult patients only (AP)	Pediatrics/Adults-Pediatrics patients (PAP)	Statistical analysis among groups
	% (Nr.)	**% (Nr.)**	
	70.5 (31)	**29.5 (13)**	
Centers location			
A – Northern Italy	54.8 (17)	69.2 (9)	p=0.38 (C)
B – Central Italy	9.7 (3)	23.1 (3)	p=0.34 (F)
C – Southern Italy	35.5 (11)	7.7 (1)	p=0.08 (F)
	p=0.0084* (C)	p=0.0183* (C)	
	Answer B***, p0.0148 (Z)	Answer A**, p=0.0453 (Z)	
1. In your hospital, are there wards reserved for COVID-19 patients?			
A – Yes	90.3 (28)	100 (13)	p=0.80 (F)
B – No	9.7 (3)	0.0 (0)	—
	Answer A**, p<0.0001 (B)	Answer A**, p<0.0001 (B)	
2. In your center, is there a stem cell transplantation unit?			
A – Yes	93.5% (29)	100% (13)	p=1.00 (F)
B – No	6.5% (2)	0.0% (0)	—
	Answer A**, p<0.0001 (B)	Answer A**, p<0.0001 (B)	
3. In your center, were the number of beds reduced during the COVID-19 pandemic?			
A – Yes	19.4% (6)	30.8% (4)	p=0.45 (F)
B – No	71.0% (22)	61.5% (8)	p=0.72 (F)
C – Other	9.6% (3)	7.7% (1)	p=1.00 (F)
	p<0.0001* (C)	p=0.058 (C)	
	Answer B**, p=0.0005 (Z)		
	Answer C***, p=0.0148 (Z)		
4. In your center, did you have any COVID -19 positive patients? (swab or serology or rapid test positivity)			
A – Yes	32.3% (10)	69.2% (9)	p=0.0239* (C)
B – No	67.7% (21)	30.8% (4)	—
	p=0.0501 (B)	p=0.18 (B)	
5. In your center, did you have any patients with signs or symptoms associated to COVID-19?			
A - Yes	22.6% (7)	30.8% (4)	p=0.71 (F)
B - No	77.4% (24)	69.2% (9)	—
	Answer B**, p=0.0021 (B)	p=0.18 (B)	
6. In your hospital, was there a separate pre-triage area for patients with COVID-19 signs or symptoms?			
A - Yes	77.4% (24)	76.9% (10)	p=1.00 (F)
B - No	22.6% (7)	23.1% (3)	—
	Answer A**, p=0.0021 (B)	p=0.057 (B)	

7. Who worked in the triage area?			
A - Nurses only	41.9% (13)	46.2% (6)	p=0.80 (C)
B - Nurses and Doctors	58.1% (18) p=0.38 (B)	53.8% (7) p=0.79 (B)	—
8.Which tests were performed in the triage area?			
A - Body temperature only	16.1% (5)	15.4% (2)	p=1.00 (F)
B - Body temperature with additional tests	83.9% (26) Answer B**, p=0.0001 (B)	84.6% (11) Answer B**, p=0.0129 (B)	—
9. Were nasopharyngeal swab tests performed before patient admission?			
A - Yes	96,8% (30)	92.3% (12)	p=0.51 (F)
B - Only for patients with signs/symptoms	0.0% (0)	7.7% (1)	p=0.30 (F)
C - Other (Type of treatment)	3.2% (1) p<0.0001* (Cm) Answer A**, p=0.0005 (Z) Answer B***, p=0.0008 (Z) Answer C***, p=0.0022 (Z)	0.0% (0) p<0.0001* (Cm) Answer A**, p=0.0006 (Z) Answer C***, p=0.0202 (Z)	p=1.00 (F)
10. If so, when were they tested?			
A - The day before admission	41.9% (13)	46.2% (6)	p=0.80 (C)
B - Some days before admission	35.4% (11)	15.4% (2)	p=0.28 (F)
C - Before and repeated at admission	9.7% (3)	15.4% (2)	p=0.62 (F)
D - At admission	9.7% (3)	23.1% (3)	p=0.34 (F)
E - Some days before and then repeated the day before admission	3.2% (1) p=0.0008* (Cm) Answer A**, p=0.0114 (Z) Answer E***, p=0.0221 (Z)	0.0% (0) p=0.12 (Cm)	p=1.00 (F)
11. When did you receive the tests results after nasopharyngeal swab?			
A - Within 12 hours	48.4% (15)	38.5% (5)	p=0.55 (C)
B - From 12 to 24 hours	41.9% (13)	53.8% (7)	p=0.47 (C)
C - After 24 hours	9.7% (3) p=0.0183* (Cm) Answer C***, p=0.0148 (Z)	7.7% (1) p=0.12 (Cm)	p=1.00 (F)
12. Where were COVID-19-positive hematology patients needing hospitalization admitted?			
A - In a COVID-19 ward	87.0% (27)	100% (13)	p=0.42 (F)
B – In hematology ward	6.5% (2)	0.0% (0)	p=1.00 (F)
C - Other: medical-oncological ward	6.5% (2) p<0.0001* (Cm) Answer A**, p<0.0001 (Z) Answer B***, p=0.0060 (Z) Answer C***, p=0.0060 (Z)	0.0% (0) p<0.0001* (Cm) Answer A**, p<0.0001 (Z) Answer B***, p=0.0202 (Z) Answer C***, p=0.0202 (Z)	p=1.00 (F)
13. Were more restrictive measures for visitor access to the hematology ward taken to prevent the spread of infection?			
A - Yes	100% (31)	100% (13)	p=1.0 (F)
B - No	0.0% (0) Answer A**, p<0.0001 (B)	0.0% (0) Answer A**, p<0.0001 (B)	—

14. If so, what measures were taken?			
A - Visitors were not allowed	61.3% (19)	76.9% (10)	p=0.49 (F)
B - Only visitors of patients with particular clinical conditions were allowed	25.8% (8)	23.1% (3)	p=1.00 (F)
C - Visitors of patients in particular clinical conditions were allowed, though for a reduced time	12.9% (4)	0.0% (0)	p=0.42 (F)
	p=0.0029* (Cm) Answer A**, p=0.0111 (Z) Answer C***, p=0.0335 (Z)	p=0.0023* (Cm) Answer A**, p=0.0131 (Z) Answer C***, p=0.0202 (Z)	
15. Were screening tests for healthcare professionals performed?			
A – Yes	77.4% (24)	84.6% (11)	p=0.71 (F)
B – No	22.6% (7)	15.4% (2)	—
	Answer A**, p=0.0021 (B)	Answer A**, p=0.0119 (B)	
16. Which screening tests were performed?			
A - Not applicable (No to question 15)	22.6% (7)	15.4% (2)	p=0.71 (F)
B - Nasopharyngeal swab	22.6% (7)	23.1% (3)	p=1.00 (F)
C - Blood tests (blood samples or rapid tests)	12.9% (4)	15.4% (2)	p=1.00 (F)
D – Both	41.9% (13)	46.1% (6)	p=0.80 (C)
	p=0.14 (Cm)	p=0.35 (Cm)	
17. Were the tests routinely repeated?			
A - Yes	64.5% (20)	76.9% (10)	p=0.50 (F)
B – No	12.9% (4)	7.7% (1)	p=1.00 (F)
C - Not applicable (No to question 15)	22.6% (7)	15.4% (2)	p=0.71 (F)
	p=0.0009* (Cm) Answer A**, p=0.0043 (Z) Answer B***, p=0.0335 (Z)	p=0.0036* (Cm) Answer A**, p=0.0131 (Z)	
18. Please describe characteristics of screening			
A – Structured screening	67.7% (21)	61.5% (8)	p=0.74 (F)
B – One-off test	6.5% (2)	15.4% (2)	p=0.57 (F)
C - No test	22.6% (7)	7.7% (1)	p=0.41 (F)
D - Not specified	3.2% (1)	15.4% (2)	p=0.20 (F)
	p<0.0001* (Cm) Answer A**, p<0.0001 (Z) Answer B***, p=0.0248 (Z) Answer D***, p=0.0092 (Z)	p=0.0237* (Cm) Answer A**, p<=0.0184 (Z)	
19. Were any healthcare professionals COVID-19-positive?			
A – Yes	41.9% (13)	61.5% (8)	p=0.23 (C)
B – No	58.1% (18)	38.5% (5)	—
	p=0.38 (B)	p=0.42 (B)	
20. Were the COVID-19-positive healthcare professionals in self-isolation?			
A - Yes	100% (31)	100% (13)	p=1.00 (F)
B - No	0.0% (0)	0.0% (0)	—
	Answer A**, p<0.0001 (B)	Answer A**, p<0.0001 (B)	
21. Please specify how the healthcare professionals or patients who had contact with COVID-19-positive healthcare professionals/patients were managed			
A - Alerting competent authorities	12.9% (4)	23.1% (3)	p=0.40 (F)

B - Education	0.0% (0)	7.7% (1)	p=1.00 (F)
C - Screening tests	41.9% (13)	38.5% (5)	p=0.83 (C)
D - Not managed	19.3% (6)	23.1% (3)	p=1.00 (F)
E – Not specified/unknown	22.6% (7)	7.7% (1)	p=0.41 (F)
F – PPE	3.2% (1) p=0.0007* (Cm) Answer C**, p=0.0013 (Z) Answer B***, p=0.0127 (Z) Answer F***, p=0.0401 (Z)	0.0% (0) p=0.17 (Cm)	p=1.00 (F)
22. Did self-isolated COVID-19-positive healthcare professionals repeat the nasopharyngeal swab before returning to work?			
A - Yes	90.3% (28)	100% (13)	p=0.80 (F)
B - No	9.7% (3) Answer A**, p<0.0001 (B)	0.0% (0) Answer A**, p<0.0001 (B)	—
23. What personal protective equipment (PPE) was used during daily care of (COVID-19-negative) hematology patients?			
A - Surgical mask	83.9% (26)	92.3% (12)	p=0.69 (F)
B - FFP2	29.0% (9)	23.1% (3)	p=1.00 (F)
C - FFP3	3.2% (1)	0.0% (0)	p=1.00 (F)
D - TNT gown	35.5% (11)	38.5% (5)	p=1.00 (F)
E - Water-resistant gown	22.6% (7)	23.1% (3)	p=1.00 (F)
F - Full suit	0.0% (0)	0.0% (0)	p=1.00 (F)
G - Visor	6.5% (2)	23.1% (3)	p=0.14 (F)
H - Safety glasses	29.0% (9)	15.4% (2)	p=0.46 (F)
I - Both visor/glasses	22.6% (7) p<0.001* (Q) Answer A**, p<0.05 (MRD)	0.0% (0) p<0.001* (Q) Answer A**, p<0.05 (MRD	p=0.10 (F)
24. Were masks lacking during the acute phase of COVID-19?			
A - Yes	48.4% (15)	38.5% (5)	p=0.75 (C)
B - No	51.6% (16) p=0.86 (B)	61.5% (8) p=0.42 (B)	—
25. Were any other PPEs lacking?			
A – No	38.7% (12)	53.9% (7)	p=0.36 (C)
B - Gowns	48.4% (15)	38.5% (5)	p=0.75 (C)
C - Safety glasses/Visors	35.5% (11)	30.8% (4)	p=1.00 (F)
D – Gloves	32.3% (10)	0.0% (0)	p=0.0239* (F)
E - Other (shoe cover, cap)	6.5% (2) p=0.011* (Q) Answer A>E*, p<0.05 (MRD)	0.0% (0) p=0.010* (Q) Answer A>D*, p<0.05 (MRD) Answer A>E*, p<0.05 (MRD)	p=1.00 (F)
26. When were masks worn?			
A - Only in patients' rooms or during patient care	6.5% (2)	0.0% (0)	p=1.00 (F)
B - Everywhere and all the time in the ward/hospital	93.5% (29)	100% (13)	p=1.00 (F)

C - Other	0.0% (0) p<0.0001* (Cm) Answer B**, p<0.0001 (Z) Answer A***, p=0.0060 (Z) Answer C***, p=0.0008 (Z)	0.0% (0) p<0.0001* (Cm) Answer B**, p<0.0001 (Z) Answer A***, p=0.0202 (Z) Answer C***, p=0.0202 (Z)	p=1.00 (F)
27. How often were masks changed?			
A - At every shift	67.7% (21)	46.2% (6)	p=0.18 (C)
B – Regularly, according to manufacturer's instructions	29.0% (9)	38.5% (5)	p=0.72 (F)
C - Other	3.2% (1) p<0.0001* (Cm) Answer A**, p=0.0016 (Z) Answer C***, p=0.0022 (Z)	15.4% (2) p=0.37 (Cm)	p=0.20 (F)
28. Was access to any work environment limited during daily practice? (e.g., not over 2 HCPs in the same room, if not needed)			
A - Yes	67.7% (21)	46.2% (6)	p=0.18 (C)
B - No	9.7% (3)	23.1% (3)	p=0.34 (F)
C - No, but instruction on safety distance was provided	22.6% (7)	30.8% (4)	p=0.71 (F)
D - Other	0.0% (0) p<0.0001* (Cm) Answer A**, p<0.0001 (Z) Answer D***, p=0.0030 (Z)	0.0% (0) p=0.12 (Cm)	p=1.00 (F)
29. Did your hospital/department provide any official recommendations or directives on COVID-19 emergency management?			
A - Yes	100% (31)	100% (13)	p=1.00 (F)
B - No	0.0% (0)	0.0% (0)	p=1.00 (F)
C - Other	0.0% (0) p<0.0001* (Cm) Answer A**, p<0.0001 (Z) Answer B***, p=0.0008 (Z) Answer C***, p=0.0008 (Z)	0.0% (0) p<0.0001* (Cm) Answer A**, p=0.0001 (Z) Answer B***, p=0.0202 (Z) Answer C***, p=0.0202 (Z)	p=1.00 (F)
30. Which areas did these recommendations/directives cover?			
A - Patient management	100% (31)	100% (13)	p=1.00 (F)
B - Access Management (visitors)	90.3% (28)	100% (13)	p=0.80 (F)
C - Personal protective equipment (PPE) management	90.3% (28)	100% (13)	p=0.80 (F)
D - Infection control of workers	74.2% (23)	84.6% (11)	p=0.70 (F)
E – Other	6.5% (2) p=0.001* (Q) Answer E***, p<0.05 (MRD)	23.1% (3) p=0.001* (Q) Answer E***, p<0.05 (MRD	p=0.14 (F)
31. Did your hospital/department provide any recommendations/instructions to patients and their familiars to prevent contagion?			
A - Yes	58.1% (18)	76.9% (10)	p=0.31 (F)
B - No	25.8% (8)	15.4% (2)	p=0.70 (F)
C - I don't know	16.1% (5) p=0.0113* (Cm) Answer A**, p=0.0258 (Z)	7.7% (1) p=0.0036* (Cm) Answer A**, p=0.0131 (Z)	p=0.69 (F)
32. Did your center provide any specific recommendations or instructions to hematology patients?			

A - Yes B - No C - I don't know	54.8% (17) 38.7% (12) 6.5% (2) p=0.0035* (Cm) Answer C***, p=0.0060 (Z)	38.5% (5) 53.8% (7) 7.7% (1) p=0.12 (Cm)	p=0.32 (C) p=0.36 (C) p=1.0 (F)
33. In your hospital, how was information provided and managed?			
A - Emails received at institutional email address B – Through an app C - Hospital intranet D – In the ward from head nurses or medical directors E - Word of mouth F - Other	74.2% (23) 6.5% (2) 74.2% (23) 19.4% (6) 3.2% (1) 3.2% (1) p<0.001* (Q) Answer A**, p<0.05 (MRD) Answer C**, p<0.05 (MRD) Answer B***, p<0.05 (MRD) Answer D***, p<0.05 (MRD) Answer E***, p<0.05 (MRD) Answer F***, p<0.05 (MRD)	84.6% (11) 7.7% (1) 76.9% (10) 0.0% (0) 15.4% (2) 15.4% (2) p<0.001* (Q) Answer A**, p<0.05 (MRD) Answer C**, p<0.05 (MRD) Answer B***, p<0.05 (MRD) Answer D***, p<0.05 (MRD) Answer E***, p<0.05 (MRD) Answer F***, p<0.05 (MRD)	p=0.70 (F) p=1.0 (F) p=1.0 (F) p=0.19 (F) p=0.20 (F) p=0.20 (F)
34. What is your personal opinion on how the following issues were managed by your hospital/institution? +			
A – Availability of PPEs	mean ±SD = 6.9±2.0 median = 7 median 95% CI =6-8 KS: p=0.0323 (rN)	mean ±SD = 7.2±2.4 median = 8 median 95% CI =5-9.5 KS: p=0.0248 (rN)	p=0.61 (MW) reject Normality (KS), p>0.05
B - Patient protection	mean ±SD = 7.2±2.3 median = 7 median 95% CI =7-8 KS: p=0.0033 (rN)	mean ±SD = 7±2.4 median = 8 median 95% CI =5-9 KS: p>0.10 (aN)	p=0.91 (MW) reject Normality (KS), p>0.05
C – HCP protection	mean ±SD = 6.5±2.5 median = 6 median 95% CI =6-8 KS: p>0.10 (aN)	mean ±SD = 6.7±2.5 median = 7 median 95% CI =4.5-8.5 KS: p=0.0380 (rN)	p=0.67 (MW) reject Normality (KS), p>0.05
D – Quality of communication (rapidity, clarity)	mean ±SD = 6.5±2.6 median = 7 median 95% CI =5.6-8 KS: p=0.0325 (rN)	mean ±SD = 6.8±2.8 median = 8 median 95% CI =4.5-8.5	p=0.75 (MW) reject Normality (KS), p>0.05

			KS: p=0.0045 (rN)
+ = 10-point likert scale where 1 means “in the worstmanner” and 10 means “in the best manner” KS= Kolmogorov-Smirnov test for Normaldistribution p=p-value — = equal to previous result	*=significant test (p<0.05) ** =significant most frequent ***=significant low frequent Z= Z-test Cm=multiple chi square test	C=chi square test F= Fisher'sexact test B=Binomial test (rN) = reject Normality (aN)=accept Normality	MW= Mann-Whitney test Q=Cochran's Q test MRD= Minimum Required Differences method with Bonferroni p-value corrected

Table 3. List of responding centers

Northern Italy			
N°	**Department/Ward**	**Hospital/Institute**	**City**
1	Hematology and Transplant center	ASO SS Antonio e Biagio e Cesare Arrigo	Alessandria
2	Division of Hemato-Oncology	Istituto Oncologico della Svizzera Italiana	Bellinzona
3	Division of Hematology	Sant'Orsola Malpighi Hospital	Bologna
4	Oncology, Hematology and HSCT Pediatric Program	Sant'Orsola Malpighi Hospital	Bologna
5	Division of Medical Oncology	Sant'Orsola Malpighi Hospital	Bologna
6	Division of Hematology	ASST Spedali Civili	Brescia
7	Division of Hematology	ASST Valleolona	Busto Arsizio
8	Division of Hematology	AO S. Croce e Carle	Cuneo
9	Division of Hematology and Transplant	Azienda Ospedaliera Universitaria	Ferrara
10	Departiment of Pediatric Hemato-Oncology	IRCCS G. Gaslini	Genova
11	Hematology Unit	AULSS 3 Serenissima	Mestre
12	Division of Hematology	European Institute of Oncology	Milan
13	Department of Medical Oncology 1-Hematology	Istituto Nazionale Tumori	Milan
14	Divisione of Hematology and Transplant	IRCCS Policlinico	Milan
15	Pediatric Onco-Hematology	Azienda Ospedaliera	Padova
16	Division of Hematology and Transplant	Ospedale Guglielmo da Saliceto AUSL	Piacenza
17	Hematology Unit	Azienda USL-IRCCS	Reggio Emilia
18	Hematology Unit	AUSL Romagna	Rimini
19	Stem Cell Transplant and Cellular Therapy Center	Ospedale Infantile Regina Margherita	Turin
20	Hematology and Cellular Therapy Center	AO Mauriziano	Turin
21	Hematology and Transplant	Citta della Salute e della Scienza	Turin
22	Pediatric Hemato-Oncology and BMT Unit	IRCCS Burlo Garofolo	Trieste
23	Hematology and BMT Center	Azienda Ospedaliera Universitaria	Udine
24	Pediatric Hemato-Oncology	Azienda Ospedaliera Universitaria	Verona
25	Hematology Division Out-patient section	AULSS 8	Vicenza
26	Hematology Division In patient section	Aulss 8 Berica Ospedale San Bortolo	Vicenza
Central Italy			
N°	**Department/Ward**	**Hospital/Institute**	**City**
1	Hematology and Transplant Center	AORMN San Salvatore	Pesaro
2	Department of Hematology	Ospedale Civile	Pescara
3	Division of Hematology	Policlinico Tor Vergata	Rome
4	Onco-Hematology Department	Bambino Gesù Pediatric Hospital	Rome
5	Division of Hematology	Fondazione Policlinico Gemelli IRCCS, Roma	Rome
6	Division of Hematology and Stem Cell Transplantation	Fondazione Policlinico Gemelli IRCCS, Roma	Rome
Southern Italy			
N°	**Department/Ward**	**Hospital/Institute**	**City**
1	Division of Hematology and Hemopoietic Transplantation	AORN – S. Giuseppe Moscati	Avellino
2	Hematology and Transplant Division	Policlinico	Bari
3	Oncology Department, Hematology Division	Ospedale Vito Fazzi	Lecce

4	Hematology and HSCT Division	FEDERICO II University Hospital	Naples
5	Hematology and HSCT Division	AORN A. Cardarelli	Naples
6	Hematology Division	ASL Salerno	Salerno
7	Oncology Department, Hematology Division	Ospedali Riuniti Villa Sofia Cervello	Palermo
8	Division of Hematology	AOR S. Carlo	Potenza
9	Division of Hematology	AO Bianchi Melacrino Morelli	Reggio Calabria
10	Division of Hematology and HSCT	Aou S. Giovanni di Dio e Ruggi D'Aragona	Salerno
11	Division of Hematology	AOU Sassari	Sassari
12	Hematology and BMT Center	Pia Fondazione Ospedale Cardinale G. Panico	Tricase