Executive Summary

Development of the latest evidence-based multidisciplinary clinical practice guidelines for the treatment of COVID-19

patients : Application of the living guideline methodology

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☐ Background

As of 2021, COVID-19 has become an infectious disease with the highest reported number of cases worldwide. Despite the relatively short period to vaccine development and disease control efforts by each country, the emergence of many variants has made it difficult for people to return to their daily life before the COVID-19 pandemic. In South Korea, the health of the citizens could be protected through successful disease control measures; however, there is still a high demand for the development of evidence-based clinical practice guidelines for the actual clinical practice treatment of inpatients with pneumonia or infection in other organs. Although major international agencies and governments are in the process of developing their own clinical practice guidelines, in South Korea, an evidence-based national clinical practice guideline has not yet been developed.

Since the COVID-19 pandemic, clinical trials have been actively conducted globally, resulting in a nearly everyday publication of clinical findings. Therefore, from a methodological point of view, an evidence-based guideline, with continued verification of additional evidence and updated recommendations, needs to be developed rapidly.

The National Evidence-based Healthcare Collaborating Agency (NECA), together with the Korean Society of Infectious Diseases (KSID), were able to develop the first guidelines within a short period from October 15 to December 31, 2020, focusing on the pharmacological treatments. In 2021, under a working agreement with the Korean Academy of Medical Sciences (KAMS) and together with seven affiliated academic societies, the scope of the guideline development was expanded to include pharmaceuticals, respiratory/critical care, pediatric infections, and diagnostic and imaging tests.

□ Objective

This study aimed to improve clinical outcomes of COVID-19 patients and help decision-making of clinicians. We systemically reviewed evidence on the latest treatments for COVID-19 and outline evidence-based clinical practice guidelines for healthcare professionals. In addition, in terms of the guideline development methodology, we would like to apply the principle of the guideline development methodology of promptness and up-to-dateness as strictly as possible in emergency situations such as COVID-19.

□ Methods

Regarding the guideline development methodology, we applied the living guidelines development methodology that is consistently being updated using the latest evidence. Currently, a significant number of practice guidelines are being published by major countries and organizations, so adoption or adaptation were considered in some areas. However, there was a difference between the time when the evidence search was completed and the current time in the existing guidelines, so it was decided to use *de novo* development method in actual development, and to refer to the existing guidelines for writing recommendations. The guideline development process is described in the following sections.

○ Development of the scope of the guidelines and clinical questions

The scope of the first clinical practice guideline in 2020 included pharmacological treatment and antibody therapy that could be helpful in improving the prognosis of COVID-19 patients, and other convalescent plasma that could reduce the risk of COVID-19 infection or disease progression.

The scope of the intervention in the second clinical practice guideline in 2021 has also been expanded to include pharmacological treatment, respiratory and critical care, diagnostic tests, imaging tests, and pediatric infections. For the clinical questions,

preliminary brainstorming by the development group and review of therapeutics discussed in existing clinical practice guidelines or other major guidelines were performed in advance. Consequently, the priority of each therapeutic was determined based on a consensus by the development group.

The categories derived by informal consensus were pharmacological treatment, diagnosis, and imaging. After selecting a number of clinical questions, priority clinical questions, including respiratory/critical care and pediatric infection categories, were selected based on a 5-point scale grading method by the working committee.

Among the PICO elements, the "O – outcome," is related to the assessment of evidence level, that is, the GRADE assessment. Accordingly, important outcome indicators were listed for each clinical question through the working committee's discussions and the indicators were classified as critical or important outcome indicators by consensus, which were reflected in a summary of outcomes table.

○ Search database

For the first clinical practice guideline in 2020, literature search was limited to PubMed and KMBASE for a rapid development based on adaptation. In the revision of the second clinical practice guideline in 2021, a comprehensive literature search was planned.

In this round of comprehensive literature search, international databases (DBs) such as PubMed, EMBASE, and Cochrane CDSR, and Korean DBs, such as KMBASE and KISS, were used and the results were supplemented through manual search. Since COVID-19 is still ongoing, searches that utilized preprints from MedRxiv and bioRxiv were limited, with very rapidly changing evidence (e.g., vaccine, delta variant, etc.)

○ Search strategy

The search strategy was determined together with an information specialist. Unlike the time the first clinical practice guideline was developed, there have been changes in the search terms, such as COVID-19 having been confirmed as an official MeSH term, and other drug names have also been added. These changes and additions were accounted for.

Basically, the search terms proposed by the working committee members for each clinical question and the draft search formula reflecting such terms were obtained from PubMed. These, along with the search results, were reviewed by the working committee members, after which, opinions on revisions were accepted. The information specialist then sent the revised strategy. When the final search strategy was confirmed, a three-step strategy for searching all DBs was implemented.

The search terms were related to COVID-19 (e.g., "coronavirus," "novel coronavirus," "novel coronavirus 2019," "2019 nCoV," "COVID-19," "Wuhan coronavirus," "Wuhan pneumonia," and "SARS-CoV-2") and were selected for each intervention or therapeutic. To establish the search strategy, a natural language was selected, considering control words and synonyms, and searches were conducted according to the characteristics of each DB.

With respect to the search period, search for pharmacological treatment, which had already been conducted in the first guideline, was from June 2020 to the then most recent time (June 14, 2021). Moreover, for pediatric infections, diagnosis, imaging, and respiratory/critical care areas, the starting point was discussed according to each situation and searches were conducted sequentially, starting from March 2020 to around June 29-July 14, 2021 (which was the most recent date at the time).

○ Continuous evidence search updates (living systematic review)

Since articles on therapeutics for COVID-19 are continuously updated, the search will be updated each month and key evidence will be identified to reflect it in the revision of the recommendations. For pharmacological treatment, search was updated on the 10th of each month starting from August 2021, while for all other clinical questions, search was updated on the 10th of each month starting from September 2021. For the search updates, Ovid-MEDLINE was changed to all search engines including preprint DB search results. To manage the continuous evidence updates, Covidence, a semi-automated systematic review software, was purchased and used for literature screening.

○ Literature selection criteria

Inclusion and exclusion criteria for each clinical question were established based on the study design and PICO elements of the clinical questions. These were established through discussions held by the working committee for each clinical question. Accordingly, separate inclusion and exclusion criteria were applied according to the characteristics of the interventions and patients for whom the clinical questions were prepared. To account for the continuous nature of the literature search, the literature selection flowchart was also modified and made to reflect the continuous nature.

○ Assessment of the risk of bias in the selected literature

For the evaluation of the level of evidence(LoE) of the articles that were finally selected for each clinical question, appropriate tools for the study design were selected. Each article was independently evaluated by two researchers to reach an

agreement. If an agreement could not be reached, a third person mediated to reach an agreement. As much as possible, the two researchers were paired from NECA methodology- and clinical- working groups.

■ Tool for assessment of quality of randomized controlled clinical trials: Cochrane risk of bias

Cochrane Risk of Bias(RoB) tool consists of a total of seven items. Each item was finally graded as "low," or "high," with negative/"unclear", and low scale being graded as "low" indicating low RoB.

Each item was assessed for sequence generation method, appropriateness of the allocation concealment, blinding, processing of missing/incomplete values, selective reporting of results, and other RoB.

■ Tool for the quality assessment of nonrandomized studies: Risk of Bias for Nonrandomized Studies (RoBANS) 2.0

RoBANS is a typical assessment tool for assessing RoB in nonrandomized studies. It was developed from the "Development tool for risk of bias assessment" by the Health Insurance Review and Assessment Service in 2009 and was revised in 2013 to reflect the latest research trend, including Cochrane.

■ Quality assessment tool for the diagnostic testing and research evaluation: Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS 2.0)

QUADAS 2.0 (Whiting et al., 2011), is a typical assessment tool for diagnostic testing and research evaluation, used to assess bias and applicability in four domains. Bias is assessed in four domains – patient selection; target test; reference test; and process and timing. For each domain, RoB is assessed as "low", "high", or "unclear". Applicability is assessed in three domains – patient selection, target test, and reference test. For each domain, RoB is assessed as "low," "high," or "unclear."

○ Evidence synthesis

The research articles ultimately selected for each clinical question were classified by study design and based on the available and necessary data items which were selected for extraction. A table of basic characteristics of the studies was constructed by the working committee while it was reviewed and revised by the research team. For pre-determined outcome indicators, data were extracted according to the pre-defined data extraction format as needed for the synthesis, and for comparison of two interventional methods, data extraction format that could assess comparability was considered. The NECA methodology researchers were responsible for data extraction,

while the other researchers and working committee members were responsible for the review of the relevant clinical questions.

Using the reviewed extracted data, meta-analysis was performed when quantitative synthesis was possible, otherwise qualitative descriptive analysis was performed when this was not possible. When meta-analysis was possible, heterogeneity of data was determined. If heterogeneity was determined to be high, a random-effect model was applied, while subgroup analysis and meta-regression were performed additionally to explore the cause of heterogeneity. For publication bias, Egger's test, and the trim-and-fill methods were applied when there were 10 or more studies in the synthesis.

Review Manager (RevMan) 5.4 was mostly used as the statistics program for meta-analysis, while R 4.1.1 was used additionally for single arm analysis or others that are difficult to analyze by RevMan alone. Moreover, STATA 14.0 was used additionally for diagnostic meta-analysis.

○ Levels of evidence(LoE) and recommendations grading(RG)

LoE was assessed using the Grading of Recommendations Assessment Development and Evaluation (GRADE) methodology. In the GRADE methodology, the importance of each outcome is rated first, and then the LoE for each outcome is determined as "high," "moderate," "low," or "very low." For the RG, the direction and strength of each recommendation is determined based on the four elements considered in the GRADE methodology: 1) LoE, 2) effect size (balance between benefits and harms), 3) values and preferences of patients, and 4) resources. The strength of non-recommended practices could be differentiated as "strong" and "conditional," but the decision was made not to differentiate the strength for non-recommended practices in the existing first clinical practice guideline in consideration of practical use. However, the strength of non-recommendation was differentiated as "strong" and "conditional" for the second clinical practice guideline. GRADE also uses "only in research" and "no recommendation" for RG, but in this guideline, "inconclusive" is used, which also holds the meaning of insufficient evidence. LoE and RG are summarized in separate tables.

☐ Results

○ Recommendations and consensus process

The draft recommendations were prepared based on the informal consensus reached after review of evidence by the working committee members, at the general meeting attended by majority of the development committee members. When a consensus could not be reached through discussions, two options were discussed, and a vote was held

using a 5-point scale with a consensus being reached if the majority of the votes was 4 points (agree) or 5 points (strongly agree).

For recommendations derived by expert consensus, informal consensus was reached. When a consensus could not be reached through discussions, a vote was held using a 5-point scale with a consensus being reached if the majority of the votes was 4 points (agree) or 5 points (strongly agree). During the development of the recommendations, there were no case of formal consensus due to serious disagreement.

○ Dissemination and implementation of the clinical practice guideline

The final recommendations will be published on NECA website under "COVID-19 living guideline" and the same content will be promoted through the bulletin boards of major academic societies of each division/department. Relevant organizations, including the Ministry of Health and Welfare and the Korea Centers for Disease Control and Prevention, will be notified and the guideline will be disseminated through press releases. The level of dissemination after the publication of the clinical practice guideline can be monitored through press releases.

In addition, an english summary will be submitted to the Guideline International Network for information sharing with the international community, and methodologies and recommendations for each clinical question will be presented in a journal.

After the publication of the clinical practice guideline, changes in the use of interventions, such as pharmaceuticals, in clinical practice will be monitored, while changes in the usage of interventions will be monitored using public health and big medical data, that the steering committee have finalized.

- **Summary of recommendations: pharmaceuticals**

Recommendations for a total of 14 clinical questions are summarized as follows:

Clinical Questions	Division	Recommendation	Level of evidence (LoE)	Level of Recommendation (LoR)
CQ1. Remdesivir	Revised	1. We suggest remdesivir for COVID-19 patients who needs oxygen therapy without ventilator or ECMO.	Low	B
		[Information regarding the revision of the recommendation] Of the two previous recommendations, content and LoR corresponding to conditional recommendation are maintained, but the LoE has been lowered from 'moderate' to 'low', and the recommendation about the subjects whose		

Clinical Questions	Division	Recommendation	Level of evidence (LoE)	Level of Recommendation (LoR)
		recommendations were withheld is deleted.		
CQ2. Other antiviral drugs	Revised	2-1. Administration of favipiravir for COVID-19 patients is not recommended except for clinical trials.	Very low	C
		2-2. Administration of umifenovir for COVID-19 patients is not recommended except for clinical trials.	Very low	C
		2-3. We are unable to make direction and strength of recommendation for baloxavir marboxil administration in COVID-19 patients due to insufficient evidence about the efficacy and safety of the administration.	Very low	I
		[Information regarding the revision of the recommendation] The previous recommendation objected to the conditional against (LoR: C) for all substances due to insufficient evidence, but the recommendation was revised by classifying the substances according to the evidence confirmed during the revision.		
CQ3. Ivermectin	New	3-1. We are unable to make direction and strength of recommendation for ivermectin administration in mild or moderate COVID-19 patients due to insufficient evidence about the efficacy and safety of the administration.	Low	I
		3-2. We are unable to make direction and strength of recommendation for ivermectin administration in severe COVID-19 patients due to insufficient evidence about the efficacy and safety of the administration.	Very low	I
CQ4. Inhalant Steroids	New	4. We are unable to make direction and strength of recommendation for inhalant steroids administration in early patients diagnosed with COVID-19 due to insufficient evidence about the efficacy and safety of the administration.	Low	I
CQ5. Steroids	Revised	5-1. For severe or critical COVID-19 patients, administration of steroids is recommended. *(Clinical consideration) For the dosage of steroid, 6mg dexamethasone is administered for 7-10 days. Steroids of the same potency can be substituted (hydrocortisone 160mg, prednisone 40mg, and methylprednisolone 32mg)*	Moderate	A
		5-2. For non-severe COVID-19 patients, administration of steroids is not recommended.	Moderate	D
		[Information regarding the revision of the recommendation] Of the two existing recommendations, 5-1 maintains the recommendation and the LoR, but presents a modified steroid dose with the same potency in 'Clinical consideration'. In 5-2, the LoE is maintained, but the LoR is revised to 'D, strong aginst' by reflecting the revised definition of LoR.		
CQ6. IL-6 inhibitors	Revised	6-1. We suggest tocilizumab for severe COVID-19 patients who needs oxygen therapy with high flow oxygen or non-invasive/invasive ventilator.	Moderate	B
		6-2. Administration of tocilizumab for mild COVID-19 patients is not recommended.	Moderate	C

Clinical Questions	Division	Recommendation	Level of evidence (LoE)	Level of Recommendation (LoR)
		6-3. We are unable to make direction and strength of recommendation for sarilumab administration in COVID-19 patients taking into account domestic circumstances and global guidelines.	Moderate	I
		[Information regarding the revision of the recommendation] The previous recommendations did not classify each drug, and the conditional recommendation that it can be used in the clinical trial range in severe cases by classifying the severity, and not in mild cases. In this revision, recommendations were made for each drug, but considering that sarilumab is recently mentioned as an alternative treatment in other guidelines, the decision to recommend is withheld.		
CQ7. IL-1 inhibitors	Revised	7. We are unable to make direction and strength of recommendation for anakinra (IL-1 inhibitor) administration in COVID-19 patients due to insufficient evidence.	Low	I
		[Information regarding the revision of the recommendation] The intervenion in the previous recommendation was an interleukin-1 inhibitor, but it was defined as 'anakinra(interleukin-1 inhibitor)', and the LoE was maintained 'low' and the LoR was maintained 'I, inconclusive'.		
CQ8. Interferon	Revised	8. Administration of interferon is not recommended for COVID-19 patients.	Low	D
		[Information regarding the revision of the recommendation] The previous recommendation was recommended to be used within the scope of clinical trials due to insufficient evidence (LoE: low, LoR: B), but the recommendation was revised according to the evidence confirmed during revision.		
CQ9. JAK inhibitor	New	9-1. We suggest baricitinib, tofacitinib for COVID-19 patients who needs oxygen therapy with high flow oxygen or non-invasive ventilator.	Low	B
		9-2. Administration of baricitinib, tofacitinib for COVID-19 patients who needs oxygen therapy with invasive ventilator is not recommended.	Low	C
		9-3. We are unable to make direction and strength of recommendation for ruxolitinib administration in COVID-19 patients due to insufficient evidence about the efficacy and safety of the administration.	Very low	I
CQ10. SARS-CoV-2 non-specific IVIG	Revised	10. Administration of SARS-CoV-2 non-specific IVIG is generally not recommend for COVID-19 patients. However, use of IVIG should not be dismissed when indication for treatment of complications is present.	Low	C
		[Information regarding the revision of the recommendation] The intervention in the previous recommendation was conventional IVIG, but it was defined as 'non-specific IVIG', and the LoE was maintained 'low', and the LoR was maintainted 'C, conditional against'.		
CQ11. Convalescent plasma	Revised	11-1. Administration of convalescent plasma for moderate to severe COVID-19 patients is not recommended.	Low	C
		11-2. We are unable to make direction and strength of recommendation for convalescent plasma administration in mild COVID-19 patients due to insufficient evidence.	Low	I
		[Information regarding the revision of the recommendation] The previous recommendation was withheld from all subjects due to		

Clinical Questions	Division	Recommendation	Level of evidence (LoE)	Level of Recommendation (LoR)
		insufficient evidence(LoR: I), but the recommendation was revised by classifying the subjects according to the confirmed evidence.		
CQ12. Monoclonal antibody therapy	Revised	12-1. Monoclonal antibody therapy can be administered to patients with mild to moderate COVID-19 who are highly likely to progress to severe disease, and administration of a combination drug(LoE: moderate, LoR: B, conditional recommendation) or a single agent(regdanvimab) should be considered.(LoE: low, LoR: conditional recommendation)	combination drug Moderate	combination drug B
		Clinical consideration: *1) Refer to ⟨Table 1⟩ for the patient group that is likely to progress to severe* *2) Since monoclonal antibody therapeutics act as a specific binding reaction to SARS-CoV virus, the selection of future antibody therapeutics should be carefully made in consideration of the current situation of domestic mutant virus.*	single agent (regdanvimab) Low	single agent (regdanvimab) B
		12-2. Administration of single agent(regdanvimab) or combination antibody therapy is not recommended for severe to critical COVID-19 patients. However, it can be administered under clinical trials to (1) severe patients receiving only general oxygen therapy or (2) severe to critical COVID-19 patients who have negative SARS-CoV-2 antibody tests.	Low	C
		[Information regarding the revision of the recommendation] [1] Distinguish between single agent and combination drugs, but among single agents, Bamlanivimab was excluded from the recommended drug in consideration of the withdrawal of emergency administration approval from U.S. FDA on April 16, 2021 due to the continuous emergence of a new mutant virus showing drug resistance. [2] The second of the two existing recommendations, administration of antibody therapeutics in severe to critical COVID-19 patients is not generally recommended. However, the conditions for negative results of antibody tests were additionally specified so that antibody therapy can be administered within clinical trials only patients with general oxygen therapy, not high flow oxygen, or patients who did not produce antibodies after a certain period of time after being vaccinated or infected with COVID-19.		
CQ13. SARS-CoV-2 specific IVIG	New	13. We are unable to make direction and strength of recommendation for anti-SARS-CoV-2 specific intravenous immunoglobulin administration in COVID-19 patients due to insufficient evidence about the efficacy and safety of the administration.	Low	I
CQ14. Protease inhibitor	New	14-1. We are unable to make direction and strength of recommendation for camostat administration in COVID-19 patients due to insufficient evidence.	Low	I
		14-2. We are unable to make direction and strength of recommendation for nafamostat administration in	Very low	I

Clinical Questions	Division	Recommendation	Level of evidence (LoE)	Level of Recommendation (LoR)
		COVID-19 patients due to insufficient evidence.		

• Summary of recommendations: respiratory/critical care

Recommendations for a total of 6 clinical questions are summarized as follows:

Clinical Questions	Recommendation	Level of evidence (LoE)	Level of Recommendation (LoR)
CQ1,2 Therapeutic anticoagulant	1-1. Prophylactic dose anticoagulants can be administered rather than a therapeutic dose anticoagulants for COVID-19 patients hospitalized in general ward.	Moderate	B
	1-2. Prophylactic dose anticoagulants can be administered rather than a moderate dose anticoagulants for COVID-19 patients hospitalized in general ward.	Moderate	B
	2. Prophylactic dose anticoagulants can be administered rather than a therapeutic dose anticoagulants for COVID-19 patients hospitalized in ICU. *(Clinical consideration) In the COVID-19 patient group, where the risk of bleeding is low by evaluating the risk of bleeding, therapeutic dose anticoagulants can be selectively applied as anticoagulant prevention therapy.*	Moderate	B
CQ3. Early intubation	3. We are unable to make direction and strength of recommendation for early intubation in COVID-19 patients hospitalized in ICU.	Very low	I
CQ4. ECMO	4-1. In patients with severe acute respiratory distress syndrome (ARDS) caused by COVID-19, veno-venous ECMO (VV-ECMO) is recommended if hypoxia is difficult to improve even with proper mechanical ventilation treatment.	Very low	A
	4-2. Application of VV-ECMO is recommended for COVID-19 patients who show P/F ratio [arterial partial pressure of oxygen (PaO$_2$) to fraction of inspired oxygen (FiO$_2$) ratio] ≤ 50 mmHg for over 3 hours or ≤ 80 mmHg for over 6 hours.	Consensus recommendation	
	4-3. Timely transfer from a hospital without ECMO treatment capability to another hospital with ECMO treatment capability before worsening of the patient's condition is recommended.	Consensus recommendation	
	4-4. Old age, comorbidities(acute kidney injury or cancer, etc.), and obesity in COVID-19 patients are potential risk factors for mortality after ECMO treatment, and thus, it is recommended to make decisions carefully considering the benefits and risks of ECMO application in these patients.	Consensus recommendation	
CQ5. PEEP	5. High PEEP strategy should be considered over low PEEP strategy to improve oxygenation in patients with severe ARDS caused by COVID-19.	Very low	B
CQ6. Prone positioning	6-1. Applying awake prone positioning may be considered in COVID-19 patients who are undergoing oxygen therapy without mechanical ventilation.	Low	B
	6-2. Applying prone positioning is recommended in moderate to severe ARDS COVID-19 patients who are undergoing oxygen therapy with mechnical ventilation.	Consensus recommendation	

- **Summary of recommendations: MIS-C**

Recommendations for a total of 4 clinical questions are summarized as follows:

Clinical Questions	Recommendation	Level of evidence (LoE)	Level of Recommendation (LoR)
CQ1,2. IVIG (alone or in combination with steroids)	1. In patients with MIS-C, IVIG and steroid combination therapy can be used rather than IVIG alone.	Very low	B
	2. In patients with MIS-C, steroid monotherapy may be considered rather than IVIG monotherapy.	Consensus recommendation	
CQ3. Other immunomodulators	3. Other immunomodulators (interleukin-1 inhibitors, interleukin-6 inhibitors, and TNF-α inhibitors) may be used in patients with MIS-C who do not respond to IVIG and steroid treatment.	Consensus recommendation	
CQ4. Aspirin and/or anticoagulants	4. Low-dose aspirin therapy may be considered for reducing the risk of thrombosis in patients with MIS-C.	Consensus recommendation	

- **Summary of recommendations: Laboratory medicine**

Recommendations for a total of 2 clinical questions is summarized as follows:

Clinical Questions	Recommendation	Level of evidence (LoE)	Level of Recommendation (LoR)
CQ1,2. Rapid antigen test (RAT)	1. RAT is not generally recommended for symptomatic patients suspected of having COVID-19. Except, RAT may be considered if symptoms are present, but PCR test cannot be performed.	Low	C
	2. RAT is not recommended for asymptomatic patients suspected of having COVID-19.	Low	D

- **Summary of recommendations: Imaging test**

Recommendations for a total of 2 clinical questions are summarized as follows:

Clinical Questions	Recommendation	Level of evidence (LoE)	Level of Recommendation (LoR)
CQ1. Contrast-enhanced chest CT	1. Contrast-enhanced chest CT may be considered in COVID-19 patients suspected of having pulmonary embolism. (high D-dimer level and presentation of symptoms such as dyspnea, hypoxia, chest pain, etc.)	Very low	B
CQ2. Follow-up chest X-ray	2. We suggest a follow-up chest X-ray to patients infected with COVID-19 after the treatment process and quarantine treatment are completed.	Very low	B

☐ Conclusions

We revised the drug focused treatment guidelines developed in 2021, the scope of development was expanded to include pulmonary treatment and critical care, critically ill pediatric patients, diagnostic tests, and imaging tests. This project was a national-level clinical practice guideline involving more than 30 COVID-19 clinical experts. We intend to improve clinical outcomes of patients and help to overcome the national crisis caused by COVID-19 through continuous updating evidence and dissemination.

☐ Acknowledgement

Key words

COVID-19, Pharmacotherapy, respiratory/critical care, Multisystem Inflammatory Syndrome in Children(MIS-C), laboratory medicine, imaging test, Clinical Practice Guideline