Supplementary

Table S1 Management of anticoagulation in patients with AF during COVID-19 infection

Items (Dimension 1)	Consensus (%)
Outpatients	
1. Outpatients with COVID-19 should continue their usual oral anticoagulant therapy (VKA or DOAC), except if they require hospitalisation or an invasive or surgical procedure.	92.5[a]
Inpatients	
2a*. In all anticoagulated patients who require hospitalisation for COVID-19, switching from their usual anticoagulant therapy (VKA) to LMWH at therapeutic doses is recommended during hospital admission.	68.8[b]
2b*. In all anticoagulated patients who require hospitalisation for COVID-19, switching from their usual anticoagulant therapy (DOAC) to LMWH at therapeutic doses is recommended during hospital admission.	61.8[c]
3. In anticoagulated patients who require hospitalisation for COVID-19, switching from their usual anticoagulant therapy (VKA or DOAC) to LMWH at therapeutic doses is recommended during hospital admission:	
3.1. Only in patients with a treatment for COVID-19 that has drug interactions with the patient's oral anticoagulation on admission.	74.8[a]
3.2. In patients admitted for COVID-19 who are haemodynamically unstable.	86.4[a]
3.3. In patients with COVID-19 severity criteria.	77.6[a]
3.4. In patients with an invasive procedure planned.	81.6[a]
4. In anticoagulated patients who require hospitalisation for COVID-19, switching from VKAs to LMWH is recommended due to the difficulty to maintain adequate INR control during hospitalisation.	73.5[a]
5. In anticoagulated patients who require hospitalisation for COVID-19, switching from DOACs to LMWH is recommended due to the risk of drug interactions with treatments commonly used for COVID-19, particularly antiviral drugs, which may increase or decrease DOAC plasma levels.	66.0[b]
6. In anticoagulated patients who require hospitalisation for COVID-19, switching from DOACs to LMWH is recommended due to the lack of antidotes for some DOACs.	56.9[c]
7. When faced with the decision on switching anticoagulant treatment during hospitalisation (from oral to parenteral anticoagulation), it is important to assess the potential drug interactions between the anticoagulant drug for AF and the therapy selected to treat COVID-19.	91.2[a]
8. In patients hospitalised for COVID-19, concomitant use of apixaban, rivaroxaban, and drugs metabolised by cytochrome P450 is not recommended.	77.6[a]
10. Administration of tocilizumab for the treatment of COVID-19 has no significant effects on dabigatran and edoxaban levels in previously anticoagulated patients admitted for COVID-19.	81.0[a]
11. Patients admitted for COVID-19 with prior oral anticoagulation (VKAs and DOACs) could continue receiving such treatment, if considered appropriate based on their clinical condition, if they are candidates for colchicine therapy to treat COVID-19.	90.5[a]
12. In patients admitted for COVID-19 with prior oral anticoagulation and when switching to parenteral anticoagulation has been considered, the start of treatment with LMWH should follow the same guidelines as in patients hospitalised for other reasons (e.g., when the next DOAC dose is scheduled).	94.6[a]
13. In patients admitted for COVID-19 with prior oral anticoagulation (VKAs or DOACs), in whom there is a decision to switch to parenteral anticoagulation and a high thromboembolic risk, it would be advisable to administer LMWH at therapeutic doses.	95.2[a]
14. In patients admitted for COVID-19 with prior oral anticoagulation (VKAs or DOACs), in whom there is a decision to switch to parenteral anticoagulation and a low thromboembolic risk, it would be advisable to administer therapeutic or intermediate-high doses depending on COVID-19 severity and risk of bleeding.	86.4[a]

Table S1 (*continued*)

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Table S1 (*continued*)

Items (Dimension 1)	Consensus (%)
15. It would be advisable to maintain oral anticoagulation during admission for COVID-19 in haemodynamically stable patients with no disease severity criteria, with prior anticoagulation and no significant interactions with the specific treatment prescribed for COVID-19.	95.9[a]
16. Haemodynamically stable patients with AF hospitalised for COVID-19 may be treated with LMWH, UFH, or DOACs, depending on kidney function and other clinical conditions.	93.9[a]
17. If oral anticoagulation is maintained in the context of hospitalisation for COVID-19, treatment with DOACs is more advisable than use of VKAs as these agents:	
17.1. Have a better safety profile.	94.6[a]
17.2. Are administered in fixed doses (avoiding anticoagulation monitoring).	91.8[a]
17.3. Have fewer drug interactions.	91.2[a]
18. Oral anticoagulation with VKAs is associated with a worse prognosis in patients hospitalised for COVID-19.	66.7[a]
19. During hospitalisation for COVID-19, oral anticoagulation with VKAs could be particularly indicated for patients with specific profiles, such as those with mechanical prosthetic valves, moderate/severe mitral stenosis, or antiphospholipid syndrome.	95.2[a]
20. If treatment with VKAs must be continued (e.g. mechanical valve prosthesis and moderate/severe mitral stenosis) during hospitalisation, INR should be closely monitored while the patient is treated with drugs for COVID-19 because of the potential drug interactions.	95.2[a]
22. Presence of moderate renal impairment (eGFR 30-50 mL/min) should not be a reason for discontinuing oral anticoagulation with DOACs in AF patients hospitalised for COVID-19 if kidney function is closely monitored.	97.3[a]
23. Administration of DOACs during hospitalisation for COVID-19 is associated with a lower risk of hepatotoxicity.	72.8[a]
24. In patients with liver disease hospitalised for COVID-19, dabigatran may be an optimal anticoagulation strategy during hospitalisation, as it is associated with a lower risk of hepatotoxicity.	85.7[a]
25. Administration of dabigatran is associated with a lower risk of interaction with drugs to treat COVID-19 that are metabolised via cytochrome P450.	91.8[a]
26. In patients at high thromboembolic risk who require admission to an ICU, parenteral heparin should be administered.	89.1[a]
Rejected items (consensus was not reached)	
9. In patients admitted for COVID-19 previously anticoagulated with DOACs, switching to LMWH is recommended if patients are candidates for treatment with dexamethasone due to drug interactions with such anticoagulant treatments.	
21. In your clinical practice, if treatment with DOACs is continued during hospitalization, antithrombotic drug levels should be monitored closely to identify a potential increase/decrease in such levels due to drug interactions.	

[a], consensus reached in round 1; [b], consensus reached in round 2; [c], undetermined item in round 2 that was included in the final evaluation by the scientific committee (the percentage of consensus presented here is the one obtained in round 2); *, item 2a and 2b were a single item in round 1 ['In all anticoagulated patients who require hospitalisation for COVID-19, switching from their usual anticoagulant therapy (VKA or DOAC) to LMWH at therapeutic doses is recommended during hospital admission'], but based on the comments provided by the panellists, they were subdivided in two items for round 2. AF, atrial fibrillation (patients without mechanical valves or moderate/severe mitral stenosis).

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Table S2 Thromboprophylaxis in patients hospitalised for COVID-19

Items (Dimension 2)	Consensus (%)
Patients with no prior indication for anticoagulation admitted for COVID-19	
1. All patients who require hospitalisation for COVID-19 should receive anticoagulation, unless contraindicated.	76.9[a]
2. The management strategy for prevention of thromboembolic risk in patients with no prior indication for anticoagulation who have been hospitalised for COVID-19 should be based on:	
2.1. COVID-19 severity.	95.9[a]
2.2. Thromboembolic risk of the patient at admission.	98.0[a]
2.3. Bleeding risk of the patient.	94.6[a]
2.4. Haemodynamic stability/instability status.	93.9[a]
2.5. Hospitalisation setting: ICU *vs.* other hospital areas.	87.8[a]
2.6. All the above parameters.	95.2[a]
3. Except when contraindicated, administration of prophylactic doses of LMWH is recommended at least for all patients with no prior indication of anticoagulation requiring hospital admission for COVID-19.	95.2[a]
4. The intensity of anticoagulation doses with LMWH (prophylactic, extended/intermediate, or therapeutic) should be adjusted based on the severity of the disease and the thromboembolic risk, and considering the bleeding risk.	98.0[a]
5. In patients admitted for COVID-19 who do not meet severity criteria and who do not have a high thromboembolic risk, administration of prophylactic doses of LMWH is recommended.	92.5[a]
6. In patients hospitalised for COVID-19 with an indication for thromboprophylaxis, prophylactic doses of LMWH should be adjusted based on the following parameters:	
6.1. Disease severity.	92.5[a]
6.2. D-dimer levels.	84.4[a]
6.3. Body mass index (BMI).	92.5[a]
6.4. Kidney function.	95.9[a]
6.5. Bleeding risk.	94.6[a]
6.6. All the above parameters.	91.8[a]
7. The decision on the dose of LMWH for thromboprophylaxis in patients hospitalised for COVID-19 with low thromboembolic risk should be based, among others*, on D-dimer levels.	81.3[b]
8. Administration of intermediate LMWH doses, adjusted according to kidney function, should be considered in patients admitted for COVID-19:	
8.1. With no COVID-19 severity criteria and with high thromboembolic risk.	81.6[a]
8.2. With COVID-19 severity criteria and no high thromboembolic risk.	85.7[a]
9. Administration of therapeutic doses of LMWH, adjusted based on kidney function, should only be considered in patients admitted for COVID-19 who meet severity criteria and who have a high thromboembolic risk.	79.6[a]
10. In patients hospitalised for COVID-19 with no suspicion or confirmation of venous thromboembolic disease (VTED), administration of prophylactic doses instead of intermediate or therapeutic doses should be preferred.	72.8[a]
11. In patients hospitalised for COVID-19 with suspicion of VTED, LMWH should be administered at therapeutic doses during admission.	94.6[a]

Table S2 (*continued*)

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Table S2 (*continued*)

Items (Dimension 2)	Consensus (%)
Parenteral anticoagulation during admission for COVID-19	
1. Measurement of the following laboratory parameters is recommended to stratify the thrombotic risk of patients at hospital admission:	
1.1. C-reactive protein (CRP).	87.1[a]
1.2. Interleukin-6 (IL-6).	77.6[a]
1.3. Fibrinogen.	85.7[a]
1.4. D-dimer.	95.2[a]
1.5. Ferritin.	89.8[a]
1.6. Prothrombin time (PT).	87.1[a]
1.7. Platelet count.	88.4[a]
1.8. All the above parameters.	87.1[a]
2. For stratification of thrombotic risk, a history of high risk, including VTED, should be considered in addition to laboratory parameters.	97.3[a]
3. In the setting of hospitalisation for COVID-19, use of LMWH (once daily) may be more beneficial than use of UFH (twice daily) to minimise exposure of patients and health care professionals.	88.4[a]
4.Use of UFH is recommended only in certain cases (e.g., creatinine clearance <15 mL/min).	86.4[a]
5. If immediate invasive procedures are planned, use of UFH instead of LMWH is recommended.	79.6[a]
6. In the event of allergy to LMWH or heparin-induced thrombocytopaenia, and if kidney function is adequate, fondaparinux is recommended.	91.8[a]
7. As regards the choice of LMWH as the most appropriate anticoagulation strategy during hospitalisation for COVID-19, administration of enoxaparin, tinzaparin, and bemiparin is advised.	93.9[a]
8. As to the choice of LMWH as the most appropriate anticoagulation strategy during hospitalisation for COVID-19, enoxaparin administration is the most advisable option.	87.8[a]
9.3. In seriously ill patients admitted to ICU, LMWH at therapeutic doses is recommende[d¥]	76.9[a]
Rejected items (consensus was not reached)	
9.1. In seriously ill patients admitted to ICU, LMWH at prophylactic doses is recommended.	
9.2. In seriously ill patients admitted to ICU, LMWH at intermediate doses is recommended.	

[a], consensus reached in round 1; [b], consensus reached in round 2; [c], undetermined item in round 2 that was included in the final evaluation after consensus by the scientific committee (the percentage of consensus presented is the one obtained in round 2); *, 'among others' was included in the item after reviewing panellists' comments from round 1; [¥], 'prophylactic doses' and 'intermediate doses' were also included in round 1 (item 9.1. and 9.2.) but did not reach consensus.

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Table S3 Management of anticoagulation at hospital discharge/after COVID-19

Items (Dimension 3)	Consensus (%)
1. Use of thromboembolic prophylaxis after hospital discharge in patients with COVID-19 should be individualised based on their thromboembolic and bleeding risk.	95.2[a]
2. Continued use of LMWH for 7-15 days after discharge is considered prudent in all patients.	83.0[a]
3. Extension of thromboembolic prophylaxis should be considered after discharge from hospitalisation for COVID-19 if bleeding risk is low in:	
3.1. Patients with baseline thromboembolic risk factors and/or high risk of VTED (e.g., reduced mobility, prior VTED, active cancer, etc.) and low bleeding risk.	97.3[a]
3.2 Patients with confirmed VTED.	92.5[a]
3.3 Patients with elevated D-dimer levels (> 2 X upper limit of normal) at discharge.	85.7[a]
3.4 Patients with altered thrombotic risk markers.	88.4[a]
3.5 Patients discharged with specific treatment for COVID-19 with interactions with oral anticoagulation.	78.9[a]
3.6 Patients with no negativisation of COVID-19 tests.	57.1[c]
3.7 Patients admitted for COVID-19 who have been discharged early but still have reduced mobility.	90.5[a]
4. Patients discharged after hospitalisation for COVID-19 should receive health education regarding identification of signs and symptoms of VTED.	97.3[a]
5. In patients with prior anticoagulation in whom treatment for COVID-19 must be continued after discharge, LMWH should be maintained at therapeutic doses while treatment for COVID-19 continues only if such treatment interferes with oral anticoagulation.	90,5[a]
6. In patients treated with VKAs before admission, it is recommended to maintain LMWH at an anticoagulant dose until INR ≥2 (or INR ≥2.5 in patients with mechanical valve prosthesis or moderate/severe mitral stenosis).	94.6[a]
7. In patients treated with DOACs before admission, it is recommended to restart anticoagulant treatment at discharge when the next dose of LMWH is scheduled, as long as the patient is not receiving specific treatment for COVID-19 with drug interactions with the DOAC.	95.9[a]
8. In patients with VTED, therapeutic doses of LMWH are recommended after hospital discharge.	89.8[a]
9. To select the optimal anticoagulant treatment for preventing thromboembolic risk at discharge, the following aspects should be considered:	
9.1 Treatment efficacy and safety.	96.6[a]
9.2 Kidney function at discharge (creatinine clearance).	96.6[a]
9.3 Liver enzymes (aminotransferase levels).	91.2[a]
9.4 Risk of hepatotoxicity.	91.8[a]
9.5 Difficulty to control the effect of anticoagulation in the pandemic situation (e.g., INR monitoring).	97.3[a]
9.6 Availability of an anticoagulation reversal agent in the case of treatment with DOACs.	84.4[a]
10. It is recommended that patients hospitalised for COVID-19 who have been diagnosed with AF start anticoagulant treatment with DOACs at discharge, provided there is no contraindication.	95.9[a]
11. In patients admitted for COVID-19 previously anticoagulated with VKAs, switching to DOACs is recommended after discharge, except in case of contraindication.	93.2[a]
12. In patients with normal liver function and creatinine clearance >30 mL/min, dabigatran is an optimal anticoagulation option at hospital discharge after COVID-19 (lower risk of drug interactions, hepatotoxicity, and bleeding).	95.2[a]
13. In patients with creatinine clearance ranging from 15 and 30 mL/min, use of edoxaban as anticoagulant therapy at discharge, preferably at a dose of 30 mg, is recommended.	72.1[a]
14. In patients with elevated transaminase levels (>2 X ULN) at discharge, use of LMWH is recommended until the transaminase level decreases to ≤2 X ULN, followed by DOAC initiation.	85.0[a]
15. In patients with elevated transaminase levels (>2 X ULN), use of LMWH is recommended until the transaminase level decreases to ≤2 X ULN; anticoagulant therapy with dabigatran should then be started if creatinine clearance is >30 mL/min.	89.1[a]
16. In patients with elevated transaminase levels (>2 X ULN), use of LMWH is recommended until the transaminase level decreases to ≤2 X ULN; anticoagulant therapy with edoxaban should then be started if creatinine clearance ranges from 15 and 30 mL/min.	79.6[a]
17. Oral anticoagulation (VKAs or DOACs) is not a contraindication for the use of COVID-19 vaccines in patients with AF.	96.6[a]

[a], consensus reached in round 1; [c], this item did not reach consensus in round 1.

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Table S4 Anticoagulation monitoring in the COVID-19 pandemic setting

Items (Dimension 4)	Consensus (%)
1. In the context of the COVID-19 pandemic, anticoagulation with VKAs and the required close monitoring results in an increased risk of contagion for patients and healthcare professionals.	95.2[a]
2. Interpretation of INR monitoring results may be complex and inaccurate in the context of COVID-19 infection.	90.5[a]
3. The following measures are recommended to decrease the risk of contagion in patients anticoagulated with VKAs:	
3.1. Spacing of INR monitoring visits in patients with good therapeutic control.	78.2[a]
3.2. Differentiated INR monitoring circuits for respiratory/nonrespiratory patients in the primary care centre.	88.4[a]
3.3. Triage upon entry to the primary care centre and phone triage.	93.9[a]
3.4. Rapid INR monitoring circuits in particularly vulnerable patients (e.g., patients with mechanical valve prostheses or with moderate/severe mitral stenosis).	95.9[a]
3.5. Appointments with groups of patients depending on risk.	85.7[a]
3.6. Different times for performing INR monitoring visits, avoiding rush hours at the centres.	95.2[a]
3.7. Performance of INR monitoring visits in differentiated areas within the primary care centre.	93.2[a]
3.8. Home INR monitoring by patients (self-monitoring with portable coagulometer) with phone consultation for dose adjustment depending on the results.	93.9[a]
3.9. Home INR testing for high-risk patients in isolation due to COVID-19.	93.9[a]
3.10. Reinforcement of patient education in oral anticoagulation with VKAs, including information on the management of bleeding or bruising.	94.6[a]
3.11. Switch from VKAs to DOACs.	93.9[a]
4. In patients with AF treated with VKAs with good INR control, spacing monitoring visits should be considered to minimise the risk of contagion.	83.7[a]
5. Self-monitoring of INR should be prioritised in patients at high risk of COVID-19 infection or with risk factors associated with worse disease prognosis.	89.8[a]
6. Self-monitoring of INR should only be considered in patients with adequate cognitive function who are able to understand and use INR monitoring devices.	94.6[a]
7. In the COVID-19 pandemic setting, switching from VKAs to DOACs should be considered, provided there are no contraindications.	95.9[a]
8. If close follow-up is not possible in patients treated with VKAs who have poor anticoagulation control, switching treatment to DOACs is reasonable if there are no contraindications.	96.6[a]
9. Access to DOACs throughout the country is particularly important in the context of the COVID-19 health crisis.	97.3[a]
10. In the COVID-19 pandemic setting, it is recommended that patients with newly diagnosed AF start anticoagulant therapy with DOACs, provided there is no contraindication.	97.3[a]
11. Prescription of DOACs in patients with newly diagnosed AF could enhance:	
11.1. Patient education on oral anticoagulant therapy.	94.6[a]
11.2. Adherence to oral anticoagulant therapy.	96.6[a]
11.3. Reduction in risk of patient exposure from frequent anticoagulation monitoring visits (VKAs).	95.2[a]
12. In the context of the current health crisis, use of VKAs should only be considered in special circumstances where use of DOACs is contraindicated, such as the presence of mechanical valve prostheses or antiphospholipid syndrome.	95.9[a]

[a], consensus reached in round 1.

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Table S5 Role of telemedicine in the management and follow-up of patients with AF in the setting of the COVID-19 pandemic

Items (Dimension 5)	Consensus (%)
1. In the COVID-19 pandemic setting, telemedicine should be the method recommended to follow up patients with AF in cardiology, except in scenarios that cannot be managed through remote consultation.	81.6[a]
2. The most appropriate care management (face-to-face or otherwise) for each patient should be individualised.	92.5[a]
3. Assessment of the most appropriate type of health/medical care in a patient with AF depends on:	
3.1. The sociodemographic characteristics of the patient (age, sociocultural level, etc.).	92.5[a]
3.2. The clinical condition of the patient regarding AF.	95.9[a]
3.3. The risk situation of the patient	93.9[a]
3.4. Possible hearing/visual/cognitive impairments of the patient.	93.9[a]
3.5. The purpose of the visit (first visit after AF diagnosis, annual follow-up, visit after hospitalisation, referral from primary care due to signs of destabilisation/decompensation, etc.).	95.9[a]
3.6. The need for a physical examination or other tests.	96.6[a]
4. The appropriate consultation formats for conducting virtual visits for the follow-up of patients with AF in cardiology are:	
4.1. Phone consultation.	82.3[a]
4.2. Video call consultation.	77.6[a]
4.3. Consultation through specific telemedicine platforms (e.g., TELEA).	81.6[a]
5. Use of digital platforms for telemedicine is recommended (e.g., TELEA) to follow up patients with AF.	78.2[a]
6. Contact between the patient and the cardiology department (cardiologist and/or nursing staff) by e-mail is an appropriate supplementary strategy for off-site follow-up of patients.	73.5[a]
7. Nursing staff plays a key role in telemedicine.	93.9[a]
8. It is advisable that before a virtual visit in cardiology, nursing staff has a first contact with the patient to inform him/her of the planned visit and to identify possible hearing/visual/cognitive impairments, as well as possible signs and symptoms, to assess the most appropriate form of care (face-to-face or otherwise).	89.1[a]
9. Aspects to be reviewed in on-line consultations for follow-up of patients with AF include:	
9.1. Signs and symptoms (dyspnoea, chest pain, dizziness, palpitations, bleeding, bruising, etc.).	95.9[a]
9.2. Thrombotic risk.	96.6[a]
9.3. Bleeding risk.	98.0[a]
9.4. Achievement of monitoring targets.	95.9[a]
9.5. Anticoagulation monitoring data.	95.2[a]
9.6. Treatment adherence.	96.6[a]
9.7. Possible dose adjustments/medication changes.	98.0[a]
9.8. Concomitant medication.	97.3[a]
9.9. Biometric data taken by the patient (e.g., blood pressure, heart rate, etc.).	97.3[a]
9.10. Possible side effects.	97.3[a]
9.11. Lifestyle (diet, exercise, smoking, etc.).	95.2[a]

Table S5 (*continued*)

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Table S5 (*continued*)

Items (Dimension 5)	Consensus (%)
10. In the current pandemic situation, home monitoring of electrocardiographic parameters using smart devices (smart phones, smart watches, etc.) is recommended.	77.6[a]
11. To minimise patient exposure, virtual visits combined with remote heart rate and rhythm monitoring and/or ECG using portable devices (e.g., KardiaMobile) are recommended for the management of patients with AF.	84.4[a]
12. In the current pandemic situation, self-monitoring of INR by high-risk or especially vulnerable anticoagulated patients (with contraindication for DOACs) should be encouraged through telemedicine programmes, with the support of nursing staff.	91.2[a]
13. Telemedicine should be promoted in particularly vulnerable/frail AF patients to minimise on-site visits.	89.8[a]
14. Virtual nursing consultations with predefined protocols are recommended to follow up patients with AF (treatment adherence, symptoms, health education, medication review, etc.).	93.2[a]
15. Direct prescription of medication using the electronic prescription system is recommended.	95.9[a]
16. In the current pandemic situation, remote management of inspection validation of prescriptions should be encouraged.	95.9[a]
17. In the current pandemic situation, automatic electronic renewal of inspection validation of prescriptions should be encouraged to ensure treatment adherence.	95.2[a]
18. On-line referrals between specialties involved in the follow-up of patients with AF should be encouraged.	96.6[a]
19. On-line consultation between primary care and cardiology/haematology should be encouraged to address issues such as potential dose adjustments or restart of treatment if the patient has undergone any procedure or surgery or has been discharged for COVID-19.	97.3[a]
20. Cardiology must prepare a clinical report of the on-line visit that must be sent to the patient and his/her primary care physician.	93.9[a]

[a], consensus reached in round 1. AF, atrial fibrillation (patients without mechanical valves or moderate/severe mitral stenosis).

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