right-to-left interatrial shunt may exacerbate hypoxia and worsen COVID-19. Approximately 25% of the reported cases of acute right-to-left intracardiac shunt are associated with platypnea-orthodeoxia syndrome. This remarkable clinical phenomenon is associated with dyspnea and hypoxia when taking the upright position, which resolve on recumbency. Although the disease is rare, its recognition is important, as simply lying the patient flat may rapidly alleviate hypoxia. However, keeping the patient flat is not a feasible long-term solution. Determining the anatomical substrate of right-to-left intracardiac shunt and platypnea-orthodeoxia syndrome is required to choose the most appropriate management strategy.

We therefore recommend clinicians to consider screening for an interatrial defect with bubble-contrast echocardiography if: 1) platypnea orthodeoxia is detected; 2) the patient is more hypoxic than expected for the degree of lung injury identified; 3) hypoxemia does not significantly improve with supplemental oxygen; and 4) there is a significant drop in the PaO$_2$/FiO$_2$ ratio.

There are no data from randomized controlled trials to guide the management of patients with extrapulmonary shunt. Indeed, the standard approach to the management of refractory hypoxia, which aims to reduce IPS, can exacerbate acute right-to-left interatrial shunt and may, in fact, worsen hypoxia. Thus, improving outcomes of these unusually hypoxic patients requires treatment of the whole shunt (ie, IPS + EPS) by balancing the effects of any interventions on both IPS and extrapulmonary shunt.

Furthermore, the incidence of venous thromboembolism, stroke, and systemic arterial embolization is high in patients with COVID-19. Some of these thromboembolic phenomena may be due to paradoxical embolism via PFO.

To the editor Hospitals are currently trying to curtail elective services to reduce risk posed to patients and medical staff while increasing hospital capacity to treat patients with coronavirus disease 2019 (COVID-19). We therefore read with great interest the guidance on the performance of echocardiography by Gackowski et al, which was published in the April issue of Kardiologia Polska (Kardiol Pol, Polish Heart Journal).

We agree that echocardiography must be problem-oriented and should focus on identification of important abnormalities. During the pandemic, as ever, echocardiography should only be performed if it affects the management. In this context, the guidance on the management of valvular and structural heart disease is also relevant. These recommendations suggest that closure of patent foramen ovale (PFO) should be deferred during the pandemic.

As a consequence of these 2 guideline documents, physicians and sonographers may feel that screening for PFO is unnecessary during the COVID-19 pandemic. This may be counterproductive, because patients with PFO may be at high risk of adverse outcomes from COVID-19. Prevention of recurrence after PFO-related stroke is the only indication for PFO closure currently supported by high-quality randomized data. Another important indication is the treatment of hypoxia due to right-to-left interatrial shunt.

Acute respiratory distress syndrome that occurs with COVID-19 is unusual. In some patients with COVID-19, hypoxia and the shunt may be greater than expected for the degree of lung injury seen on imaging. The etiology of right-to-left shunt in COVID-19 is likely multifactorial. Whereas intrapulmonary shunt (IPS) is inevitable, COVID-19 may trigger right-to-left interatrial shunt in selected patients with an interatrial defect (eg, PFO). In these patients, right-to-left interatrial shunt may exacerbate hypoxia and worsen COVID-19.

The importance of detection and percutaneous closure of patent foramen ovale during the coronavirus disease 2019 pandemic
We hypothesize that, in selected high-risk patients with COVID-19, percutaneous closure of PFO could markedly improve hypoxia, reduce the need for invasive ventilation, and help to prevent paradoxical embolism. We therefore suggest that screening for PFO with bubble-contrast echocardiography and percutaneous closure of PFO should be continued during the COVID-19 pandemic.

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CONFLICT OF INTEREST None declared.

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REFERENCES


Authors’ reply We would like to thank Rajendram et al for their interest in our coronavirus disease 2019 (COVID-19) echocardiographic guidelines in the context of screening for patent foramen ovale (PFO) in patients with COVID-19. However, we disagree with the hypothesis that screening for PFO with bubble-contrast echocardiography and percutaneous closure of PFO should be continued during the COVID-19 pandemic.

Rajendram et al stated that, in selected high-risk patients with COVID-19, percutaneous closure of PFO could markedly improve hypoxia, reduce the need for invasive ventilation, and help to prevent paradoxical embolism. In our opinion, whereas the right-to-left shunt through PFO may, to some extent, contribute to hypoxia, it is certainly not the actual cause of the patient’s grave clinical status in acute respiratory distress syndrome (ARDS) induced by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. Evidence concerning the prognostic significance of the presence of PFO in ARDS is equivocal. A right-to-left shunt may be even protective against right ventricular dysfunction in acute ARDS-associated cor pulmonale. Its closure may therefore potentially lead to deterioration of the right ventricular function. Overall, there is no unequivocal evidence coming from well-designed clinical trials, which would demonstrate that PFO closure favorably affects prognosis in patients with severe hypoxia due to ARDS. In patients with severe, resistant hypoxia, veno-venous extracorporeal membrane oxygenation (V-V ECMO) may be considered. The presence of an interatrial shunt may, in fact, be beneficial in V-V ECMO.

As far as secondary stroke prevention by PFO closure is concerned, it has to be kept in mind that the annual risk of stroke due to PFO is low compared with other stroke mechanisms. Therefore, PFO should not be considered a cause of stroke until a thorough work-up has excluded alternative mechanisms. Such work-up should be postponed in patients with active COVID-19.

In summary, we argue against PFO screening in patients with COVID-19. In our opinion, the “less is more” approach is fully justified both on clinical grounds and to protect medical personnel from the unnecessary risk of SARS-CoV-2 infection.

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Authors’ reply  Thank you for publishing the comment of Rajendram et al referring to the recently published scientific statement regarding the diagnostic workup of patent foramen ovale (PFO) during the coronavirus disease 2019 (COVID-19) pandemic. The recommendation of possible deferral of elective diagnostic workup aimed at screening for PFO, which is a preventive procedure affecting long-term prognosis after cardiogenic embolism, was indeed accepted by the Polish experts, in line with the European guidelines. Transesophageal echocardiography, as part of diagnostic workup for PFO in particular, is a complex, aerosol-generating procedure with a predictable impact on echocardiography laboratory services in the era of COVID-19.

We acknowledge the comment on a possible rare scenario of platypnea-orthodeoxia as a consequence of PFO. However, this condition is truly rare in non-COVID patients (a review by Colrado et al mentions a prevalence of 2.5% in the PFO population, and not 25%, which is in line with our own observations), although proper diagnosis is valuable in individual cases of chronic, uncontrolled hypoxia. This means that, for most patients with PFO, a clinical benefit will “classically” stem from abated pathological embolism. Interestingly, strokes are not abundant during the pandemic. Even though a suspicion of PFO can be made using computed tomography or magnetic resonance imaging data, the critical diagnostic step involves transesophageal echocardiographic study with a positional maneuver, which can be a critical limiting factor in the sickest patients including those with COVID-19, especially when ventilated. Importantly, extracardiac shunting is an alternative to classical platypnea. Considering the fact that high-quality medicine requires an individualized approach and high-level diagnostic inquisitiveness, we appreciate refreshing the still uncommonly diagnosed platypnea-orthodeoxia syndrome to the readers of Kardiologia Polska (Polish Heart Journal).

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LETTER TO THE EDITOR

PFO and the COVID-19 pandemic

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