Obstetric VTE has attracted much attention because it is one of the leading causes of maternal deaths in developed countries. Although maternal-death-related VTE (MD-VTE) has decreased over the past decades in several countries, the extent of the improvement is insufficient. The United Nations Millennium Development Goal 5 targeted a reduction in maternal deaths by 75% until 2015. In Japan, according to the national vital statistics, both the rate of maternal death and that of obstetric embolism-specific maternal death have decreased by approximately 50% from 1995 to 2012 (Figure 1). However, Kobayashi et al reported that the number of obstetric PE cases had increased in Japan; the incidence of antenatal PE and the fatality rate of PE were 0.02% and 0.0025%, respectively. PE
was also identified to be the third leading cause of maternal death based on the autopsy registry in Japan.\(^8\) Most cases of MD-VTE are considered to be preventable and treatable because VTE often occurs in patients with identifiable risk factors such as thrombophilia, prior VTE, African-American women, advanced age, obesity, prolonged bed rest, cesarean section, and medical comorbidities such as heart disease, inflammatory disease, and cancer.\(^9\)

**Pathophysiology of VTE in Pregnancy**

Pregnancy itself is a well-known risk factor for VTE.\(^4\) There are 3 main factors known as Virchow’s triad for developing VTE: hypercoagulability, stasis of blood flow and endothelial injury (Figure 2). These physiological changes are commonly present even during a normal pregnancy. Pregnancy is associated with thrombocytopenia, increased clotting factors, decreased protein S activity, resistance to protein C activity, and reduced fibrinolysis.\(^10\) Venous stasis is caused by the gravid uterus or the necessity for bed rest during hyperemesis, preterm labor, or recovery from cesarean section. Endothelial injury may occur as a result of cesarean complications. All these factors are classified into at least 1 of the 3 components of the Virchow’s triad, predisposing pregnant women to DVT.

**Clinical Outcome of Obstetric VTE Under the Current Guidelines**

In order to increase awareness of the importance of prevention, early detection, and treatment of VTE, several guidelines for the management of obstetric VTE have been published or revised in the past decade in Western countries.\(^8,11\) These guidelines have been referenced and partly incorporated into the current Japanese guidelines.\(^12,13\) In this issue of the Journal, Tanaka et al.\(^14\) report the profiles of 13 cases of MD-VTEs using data from the Maternal Death Reporting System in Japan of the Japan Association of Obstetricians and Gynecologists and reviewed by the Maternal Death Exploratory Committee for the years 2010–2013. The authors found that the incidence rate of MD-VTE during pregnancy in 2010–2013 was significantly increased compared with 1991–1992, despite the significant reduction in the overall rate of MD-VTE. This study demonstrates the real-world clinical practice of obstetric VTE prevention based on the currently available guidelines in Japan. The improvement in the overall rate of MD-VTE, which was consistent with the trend in the vital statistics (Figure 1),\(^6\) appears to have influenced the guidelines. However, careful attention should be paid to the fact that the incidence of MD-VTE during pregnancy has increased.\(^14\) As the authors point out, obstetric VTE prophylaxis during pregnancy should be optimized because some women will have a fatal outcome. A reduction in mortality is expected to be achieved with the latest\(^13\) or the next revised guidelines. In the present study by Tanaka et al., risk factors for VTE during pregnancy were not identified except for low body mass index (BMI).\(^14\) This finding is in contrast to previous studies, in which women with high BMI were rather at a risk of VTE.\(^5,15\) Thus, further studies are needed to examine the discrepancy and to identify new risk factors for VTE during pregnancy.

**Role of Cardiologists in the Management of Obstetrical VTE**

There is a growing trend in Japan for later-life pregnancies. Advanced maternal age is often associated with medical disorders, such as obesity and life-style-related diseases that could further increase the risk of obstetrical complications, including VTE. The difficulty managing life-threatening VTE requires a multidisciplinary team with obstetricians, cardiologists, emergency physicians, radiologists, cardiovascular surgeons, and anesthesiologists. The current guidelines recommend that high-risk patients should be offered pre-pregnancy counseling and risk assessment for VTE, and a referral to an appropriate facility, if necessary, should be considered.\(^9,13\) However, some doctors are unfamiliar with physiological changes during preg-
nancy, which may cause cardiologists to be reluctant to treat pregnant women. Prophylaxis of obstetrical VTE under the current guidelines is important but requires improvement. It is important to improve the early detection and treatment of VTE, in which cardiologists should play a major role. The increase in MD-VTE can be reduced in the future by sharing and expanding knowledge regarding the management of pathophysiological conditions in pregnant women.

References