with chi-squared tests. The project was approved by the Mass General Brigham Human Subjects Research Committee.

RESULTS: This analysis included 45,394 deliveries, of which 35,368 had a recorded second stage time. PPH occurred in 5.7% of deliveries; 1.5% had an EBL of ≥1500 mL. The AUC for the EOCS was 0.61 (95% confidence interval [CI], 0.60–0.62) for all women and 0.57 (95% CI, 0.55–0.58) for those who reached the second stage. Similar AUCs were seen for the subgroup with EBL of ≥1500 mL: 0.64 (95% CI, 0.63–0.67) and 0.59 (95% CI, 0.56–0.62) for all women and those who reached the second stage, respectively. Despite its lower discrimination, the calibration plot in the Figure revealed that the EOCS did identify a group of women with a significantly higher risk for PPH: those in the top decile of predicted risk (EOCS, ≥34) had a PPH incidence of 11.9% compared with 5.0% in the remainder of the population (P<.001). The EOCS was less well calibrated for women who reached the second stage, indicating it may be less useful for stratifying risk at this time point. The calibration plots revealed that the EOCS did not identify a high-risk group for EBL of ≥1500 mL as clearly as it did for all PPHs.

CONCLUSION: Although AUCs were lower than those reported for SMM, the EOCS did identify a group of women admitted in labor at high risk of PPH. This study demonstrates the potential applicability of this risk adjustment tool designed for SMM to also predict PPH among women in labor, which may facilitate the translation of this type of risk tool into clinical practice.

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OBJECTIVE: More than 60% of women are overweight or obese in the United States, with obesity the most common clinical risk factor in obstetrical practice. Although increasing maternal body mass index (BMI) is thought to be associated with lower ultrasound image quality, no large-scale studies have quantified the effect in real-world settings. We investigated the effect of BMI on image quality of standard fetal views at the time of the routine midtrimester ultrasound.

STUDY DESIGN: Retrospective analysis of ultrasound images, using a large real-world dataset, prospectively acquired at the John Radcliffe Hospital in Oxford, United Kingdom, during routine anomaly screening (18–23 weeks’ gestation) on 5 different ultrasound machines by 20 qualified sonographers. After institutional review board approval, all images were fully anonymized. Detailed, objective quality scoring of each ultrasound image (without knowledge of maternal BMI) was

The effect of maternal body mass index on fetal ultrasound image quality

REFERENCE:
Comparison between BMI category and the mean quality score for all images (main panel, $P<.05$). The mean quality score for each criterion in each of the 6 standard views are shown in panels (A) head in the TV plane, (B) sagittal view of the spine, (C) abdominal circumference (D) head in the TC plane (E) femur length, and (F) coronal view of the lips.

BMI, body mass index; TC, transcerebellar; TV, transventricular.

undertaken by a team of 12 independent sonographers. We assessed 6 standard views: the transventricular and trans cerebellar head views, abdominal circumference, femur length, sagittal spine, and coronal view of the lips. For each image, a quality score was generated. Nonparametric testing was used to assess the association between BMI category (<25, 25–30, 30–35, and ≥35 kg/m²) and quality on all images (pooled analysis, significance level set at P < .05). We also assessed the impact of BMI on individual image criteria for each view.

RESULTS: We assessed 26,954 ultrasound images from 3251 women, with 1788 (55%), 843 (26%), 383 (12%), and 237 (7%) in the 4 BMI groups, respectively. There was a decrease in image quality with increasing maternal BMI for all views (Figure) (Kruskal Wallis test, P < .05). Some clinical criteria were more affected by BMI than others (Figure): for instance, the visibility of the cavum septi pellucidi in the transventricular and trans cerebellar views and visibility of the umbilical vein in the abdominal circumference view decreased most with higher BMI category. Magnification criteria were not significantly affected by BMI, probably because magnification, a geometric criterion, does not directly relate to image appearance and is under the control of the sonologist.

CONCLUSION: We assessed ultrasound images of standard fetal views taken during routine midtrimester ultrasound examinations, scored these images objectively, and assessed image quality by maternal BMI. Using a large “real-world” image dataset acquired by a large number of sonographers on multiple ultrasound machines, we were able to show a consistent and substantial effect: the higher the maternal BMI category, the less likely fetal images were to satisfy quality criteria, and some criteria were more affected than others (Figure). These raise important clinical concerns: as an example, the poor visibility of the cavum septi pellucidi with increasing BMI is important, because visualization is an important marker of normal brain development and closely associated with the formation of the corpus callosum. In addition, the finding that head, abdomen, and femur views are affected by BMI category is of relevance for fetal biometry, because measurements are performed on these images. Whether measurements are less robust according to maternal BMI remains to be evaluated by examining the reproducibility of measurements in women with normal and high BMI. The largest consecutive differences were between image scores for BMI categories 30 to <35 and at least 35 kg/m², suggesting that fetal image quality degrades most for maternal BMI of ≥35 kg/m². This adds an important limitation to imaging, information which should be shared with women attending routine fetal anatomy scans.

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