



COMMENTARY

An Inclusive Prototype for an Obstetric Imaging Checklist

Seneesh Kumar Vikraman^{1,2,3}Received: 16 November 2017 / Accepted: 29 November 2017 / Published online: 6 December 2017
© Society of Fetal Medicine 2017

While to err is human, to exercise pre-emptive measures not to err is astutely heedful. This adaptation of an old axiom applies aptly to obstetric ultrasound. By virtue of myriad of elements requiring meticulous attention while imaging the zestful fetus, slightest of complacency can potentially translate to wastage of valuable physician time from frequent courtroom visits, expensive litigations, besides having detrimental impact on the expectant couple's quality of life. Prenatal ultrasound accounts for a large share of litigation in the obstetric practice currently [1]. It is therefore prudent to address the critical points of human error during the performance of antenatal ultrasound.

One such clinical aid aimed at subverting human errors is a checklist. A checklist is a cognitive aid steering users through accurate task completion by systematically outlining the criteria of consideration for a particular process [2]. The performance of prenatal ultrasound is generally guided by assertive statements from professional organizations and societies. The international society of ultrasound in Obstetrics and Gynecology (ISUOG) has issued guidelines for the performance of ultrasound examination of the fetus in the three trimesters [3]. The Society of Fetal Medicine (SFM), India has provided comprehensive

guidelines for the performance of mid-trimester guidelines in India crafted to regional panache [4]. While they are comprehensive and prescriptive, their pragmatic inclusion and implementation in the working milieu of a sonologist, requires the adept support of a checklist. The use of checklist has been examined in diverse healthcare scenarios [2]. The World Health Organization (WHO) surgical safety checklist is a relevant example [5]. The stringent use of the WHO checklist has considerably reduced negligence in surgical operating rooms. The utility of checklists in fact has been the backbone of fidelity protocols in high precision industries like aviation sector [6].

From the sonologist's perspective, the benefits of using a comprehensive checklist are manifold. Firstly, it ensures that the imaging practice is systematically adhering to the guidelines of a professional organization (such as those of ISUOG and SFM). A checklist created under the directives of such guidelines can suitably be adapted as per the individual expertise [7], quality of ultrasound equipment used, and the level of ultrasound care being delivered, frivolously labelled as levels I, II and III. Secondly, it is circumspect to document the ultrasound examination findings including biometry, in a written format than by mere verbal communication, ensuring their diligent entry into a reporting software in the computer workstation. It is judicious to compare the final report with the checklist and acquired images to introspect unintended omissions or inclusions [8]. Third, it aids the sonographer to exercise a personal level of quality control by ensuring at the end of the examination that she/he has visualized all the fetal parts and parameters, and hence the examination can be declared complete. It is more often than not to deem having observed a fetal part when actually it would have escaped notice. This usually happens from lack of adequate vigilance during constant fetal transpositions resulting from in

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s40556-017-0148-9>) contains supplementary material, which is available to authorized users.

✉ Seneesh Kumar Vikraman
drseneeshkv@gmail.com

¹ ARMC AEGIS Hospital Perinthallmana, Malappuram, Kerala, India

² Almas Hospital, Kottakal, Malappuram, Kerala, India

³ Palakkad, Kerala 679305, India

utero movements compounded by busy office schedule. Finally, a checklist can be of materialistic value in departmental audits, incident reporting and quality control initiatives. Overall, a checklist serves as a vital link between the professional guidelines and their implementation strategy, and as a tool for workplace quality control.

The author presents a checklist designed for the specific use of obstetric ultrasound imaging keeping in mind the requirements of fetal medicine expertise (supplementary material). The checklist is substantially based on the aforementioned principles and derives cues from the societal guidelines. It incorporates several recent understandings of the fetal anatomy and physiology. For instance, option has been made for Brainstem: Brainstem Occipital bone (BS: BSOB) ratio in addition to the intracranial translucency (IT). It is now appreciated that documenting the BS: BSOB ratio is important as variations in it indicates the possibility of posterior fossa abnormalities [9]. It is important to report the Ductus venosus pulsatility index (DVPI), since incorporating it into Down syndrome risk assessment algorithms provides superior detection and lower false positive rates. The checklist covers all the three trimesters (parameters for the first trimester highlighted in shaded cells), and accommodates for multifetal pregnancy too. This enables comparisons between the fetuses for their growth and anatomy in the likelihood of discordance. At the same time a uniform format for all trimesters, and singleton as well as multifetal pregnancies ensures better ergonomics and cost efficiency. The Doppler parameters have been enlisted in accordance with greater emphasis on PI centiles of the vessels, documentation of Cerebro-placental ratios and centiles, and Uterine artery Doppler in assessing fetal growth across mid and late trimesters, in sync with the latest developments of fetal growth restriction [10]. The documentation of previous cesarean sections at the top of the checklist circumvents the common tendency to overlook the possibility of morbid adherence in placentas implanted in the lower uterine segment [11]. The importance of imaging the myometrium and the adnexa has been emphasized, considering their potential impact on the pregnancy [12]. The second page enlists the components of fetal anatomy. It includes several fetal parameters that does not require mandatory reporting but may need to be visualized as per the intricacies of an individual case. This includes pinna, genitalia or peri-anal muscular complex. Routine visualization with or without documentation of these structures facilitates the sonologist to develop pattern recognition, and an incremental learning curve.

The checklist provided by the author is a component of an institutional protocol and not a societal guideline. Neither does it serve as a yardstick for legal scrutiny. It emphasizes the importance of checklists in ensuring quality control from a basic yet cardinal level in the sonologist's workflow. It encourages every imaging unit to develop their own checklists after suitable adaptations, tailored to their standards and needs, and acknowledging latest developments in Fetal medicine. The endmost objective should be ensuring the delivery of quality and error proof fetal imaging against the backdrop of evidence based medicine.

References

1. Sanders RC. Changing patterns of ultrasound-related litigation. *J Ultrasound Med.* 2003;22:1009–15.
2. Brigitte H, Marius T, Robert F, William S. Development of medical checklists for improved quality of patient care. *Int J Qual Health Care.* 2008;20(1):22–30.
3. <https://www.isuog.org/clinical-resources/isuog-guidelines.html>.
4. Khurana A, Makhija B, Deka D, Rama Murthy BS, Sachdev R, Chawla D, et al. Society of fetal medicine practice guidelines for the second trimester anomalies scan. *J Fetal Med.* 2014;1:11–5.
5. Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat AH, Dellinger EP, et al. Safe surgery saves lives study group. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med.* 2009;360:491–9.
6. Powell-Dunford N, McPherson MK, Pina JS, Gaydos SJ. Transferring aviation practices into clinical medicine for the promotion of high reliability. *Aerosp Med Hum Perform.* 2017;88:487–91.
7. Salomon LJ, Alfirevic Z, Berghella V, Bilardo C, Hernandez-Andrade E, Johnsen SL, et al. ISUOG Clinical Standards Committee. Practice guidelines for performance of the routine mid-trimester fetal ultrasound scan. *Ultrasound Obstet Gynecol.* 2011;37:116–26.
8. <http://www.rcog2017.com/ScientificProgramme/Presentations/Monday/Plenary/Monday20Monday15h15%20Coetzee%20Audi%201%20Mon.pdf%20sec.pdf>.
9. Volpe P, Contro E, Fanelli T, Muto B, Pilu G, Gentile M. Appearance of fetal posterior fossa at 11–14 weeks in fetuses with Dandy–Walker malformation or chromosomal anomalies. *Ultrasound Obstet Gynecol.* 2016;47:720–5.
10. Figueras F, Gratacós E. Update on the diagnosis and classification of fetal growth restriction and proposal of a stage-based management protocol. *Fetal Diagn Ther.* 2014;36:86–98.
11. Tovbin J, Melcer Y, Shor S, Pekar-Zlotin M, Mendlovic S, Svirsky R, Maymon R. Prediction of morbidly adherent placenta using a scoring system. *Ultrasound Obstet Gynecol.* 2016;48:504–10.
12. Qidwai GI, Caughey AB, Jacoby AF. Obstetric outcomes in women with sonographically identified uterine leiomyomata. *Obstet Gynecol.* 2006;107:376–82.