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Guide to Bariatric Examinations

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Overview

The 2023 ASA Workplace Health and Safety Report revealed important insights regarding musculoskeletal disorders and workplace risks for sonographers.

- *Eighty-five per cent of sonographers experienced work-related pain in the past 12 months.*¹
- *Less than one-third report their pain to their workplace.*¹
- *The pain has a significant impact on their life, including reduced sleep and non-work activities.*¹

These results are consistent with findings reported by sonographers worldwide.² The most commonly affected body regions were the shoulder on the scanning arm (69%), neck (61%), wrist/hand (44%), and upper back (43%).¹

Concerningly, one in five sonographers will sustain a career-ending injury.³ The degree and variance of pain sonographers' experience depends on the type of examinations being performed. The ASA membership⁴ and the Australasian sonography profession overall are predominantly female. Female sonographers experience higher work-related musculoskeletal disorders (WRMSD) than males.⁵ Gender factors,

including hand size, height, and biomechanical adaptations during pregnancy, could contribute to females' increased risk of WRMSD.^{5,6}

Known WRMSD risk factors identified include performing high body mass index (BMI) examinations, cardiac, vascular and obstetric scans, performing more than eighteen ultrasounds per day, scanning longer than thirty minutes, as well as working in awkward positions.^{1,7} Any type of examination can contribute to injury over time. The likelihood of sonographer injury increases when routine imaging requires increased compression, force or scan time.

This guide will assist sonographers in navigating the unique challenges of providing care for patients with higher BMI (> 30). It offers recommendations for equipment, workplace measures, scanning techniques, patient communication, and reporting that can be implemented to assist in maintaining a healthy and effective workforce. This guide aims to increase awareness, reduce WRMSD risks, and ensure patients are treated with respect and dignity.

Background

The obesity epidemic imposes enormous direct and indirect costs on healthcare.⁸ Obesity is a complex disease with many identifiable causes such as diet, lifestyle, environment, and genetics.⁹ According to the Australian Institute of Health and Welfare the proportion of adults living with overweight or obesity has increased from 56% in 1995 to 66% in 2022.¹⁰ In addition, 50% of pregnant patients in 2022 were classified as overweight or obese.¹¹

A patient with a BMI greater than 30 may be referred to as a bariatric patient. Sonographers have reported a steady increase in the number of bariatric patients being referred for ultrasound services, including those deemed above the recommended weight for other modalities. The ASA's scan times research project found that BMI was the most significant challenge for morphology and abdominal examinations.¹² It is technically challenging to obtain diagnostic quality images in patients with high BMI due to the increased depth of subcutaneous fat and its sound-attenuating characteristics.¹³ Sonographers may manage these issues by adjusting machine settings, patient position, and lifting the pannus. However, patients with severe

obesity remain a challenge even for modern ultrasound devices with advanced post-processing algorithms designed to improve imaging quality.

The ASA is committed to ensuring that all patient groups, including those with increased BMI, receive high standards of care. Equally, the ASA recognises the importance of advocating for the health and wellbeing of sonographers. Establishing reasonable expectations for ultrasound use without increasing WRMSD risk is essential. Sonographers are expected to utilise their expertise to obtain the best images possible. This includes adjusting equipment and patient position and employing advanced imaging techniques. Despite these efforts, there are instances where the quality of the examination is compromised. Sonographers must be protected from injury and liability when an ultrasound cannot be completed due to obesity-related limitations. A collaborative approach from clinicians, workplaces, and professional bodies is needed to support sonographers imaging this challenging group of patients.

Working practices

RISK ASSESSMENT

Risk assessments should be conducted by the performing sonographer before scanning bariatric patients.^{5,8} Shared decision-making may be needed between the patient, referrer, reporting doctor, and the sonographer. Referral requests should be reviewed for justification, and where possible, the appropriate diagnostic imaging examination for each clinical situation should be determined before the patient arrives. Inappropriate examinations may lead to non-diagnostic outcomes, for example, an ultrasound of the abdomen for a pancreatic lesion (when the pancreas likely will not be well visualised).⁸ Diagnostic imaging pathways, such as HealthPathways, could be utilised.¹⁴ Where appropriate, an alternative modality may be suggested by the triaging/reporting clinician.

ERGONOMIC PRACTICES

Ergonomic education for sonography staff is important to highlight best practice guidelines, risk reduction strategies, and methods for reporting and monitoring pain and injury, ensuring a long and healthy career.^{5,6,15} Evidence indicates that no amount of ergonomic training will prevent injury when the load exceeds what the body can tolerate.⁸ Assisting patients to move is an aggravating factor for injury.¹⁶ Sonographers must recognise their limits and avoid exceeding them to prevent injury.

Tips for safer scanning of bariatric patients

STAY COMFORTABLE, STAY EFFECTIVE

Frequent adjustments are essential. While ergonomic tables, chairs, and workstations support proper posture, it is important to regularly reset and check body positioning during scans and between patients. Avoid static or awkward postures. Each patient presents unique needs, necessitating adjustments to both body and environment. Maintaining awareness of movements and adhering to good ergonomic practices can reduce or prevent injury; therefore, sonographers must make a conscious effort to make these steps part of their routine.^{6,17}

- Where possible, include a variety of examinations to allow the muscles to rest and avoid repetitive movements.^{5,6,18}
- Request and document BMI: Consider adding a section for BMI on referral forms or ask administrative staff to document the patient's weight on booking. This could help distribute the workload among multiple sonographers or control the number of high BMI patients scheduled in a single day.
- Use easily moveable, height-adjustable tables and chairs to maintain a neutral posture and reduce strain.^{12,18}

- Be aware of examination bed limits and do not exceed them.
- Ensure the room is spacious enough and free from clutter to allow for easy movement and adjustments. Australian HealthCare Facility Guidelines¹⁹ recommend a standard ultrasound room size of 14m².¹⁹ For bariatric ultrasounds, additional clearance for equipment and ergonomic scanning positions are recommended. Where possible, the room should have a minimum area of 20m².²⁰ Additionally, consider dedicated mechanical patient lifting and mobilisation devices in the room design.
- Try to take a few minutes to stretch and recover after a challenging scan.
- Use imaging aids such as foot pedals when the ultrasound machine cannot be positioned within easy reach.
- Ask a second person to assist in challenging cases (for example, when scanning the left kidney from the other side of the bed).

MASTER THE MECHANICS

Utilise larger muscle groups and maintain a neutral spine.

- Do not use a two-handed technique as this will rotate the spine and shoulders increasing the risk of WRMSD.²¹
- The transducer should be gripped in a palmar/power grip (Images A and B) rather than a pinch grip (Image C).^{6, 15, 16, 18, 22} A pinch grip uses the smallest muscles of the body and requires up to five times more muscle and tendon force compared to a palmar grip.²³ A palmar grip allows for the distribution of the weight of the transducer evenly across the whole hand.⁶
- The transducer should be held with a light grip and minimal pressure.^{6, 15, 24} However, studies have shown that as BMI increases, more pressure is applied to the transducer and abdomen by the sonographer, contrary to best practice recommendations.^{17, 22, 25}
- Sonographers should alternate between standing and sitting throughout their day and decrease the duration of a static posture. For bariatric patients, standing in a lunge with a straight back may reduce the strain on the back and shoulders. Make sure the leg closest to the patient is forward and has weight evenly distributed between both feet (Image D).²⁶

Regular stretching and mini breaks are essential.

- This can help combat fatigue from the extra force and repetitive movements. Time should be allocated for regular breaks to allow the muscles and tendons time to recover.^{5, 6, 16, 17} Studies have found that over two-thirds of symptomatic respondents had less than three 10-minute breaks per day.⁵
- Reducing the number and duration of breaks may increase the risk of WRMSDs among sonographers. This is particularly relevant for those in remuneration schemes based on the number of scans performed and those with limited control over their schedules.
- Microbreaks are important when scanning high BMI patients.^{6, 18, 24, 27} This involves removing the ultrasound transducer from the patient and relaxing the arm during the examination.¹⁸ For example, the sonographer can remove the transducer from the patient while measuring a structure to give the arm a short break.



Image D – Lunge position to ensure weight is evenly distributed, and the spine remains neutral.



Image A – Palmar grip distributes the load across the whole hand and provides stability.



Image B – Power grip keeps the wrist neutral and distributes the load across the hand.



Image C – Pinch grip is not recommended due to the increased muscle and tendon force required.

PERFECT YOUR POSITIONING

High BMI patients often require additional reach.

- It is recommended that the abduction of the scanning arm should be less than 30 degrees.^{6,17} Arm abduction greater than 30 degrees has a risk of injury by reducing blood flow to the shoulder,^{6,17} which in turn leads to poor blood flow and decreased oxygenation in the rotator cuff's muscles and tendons.¹⁷ Shoulder abduction of 60 degrees corresponds to a muscle fatigue rate three times as fast compared to shoulder abduction of less than 30 degrees.²⁸ Bastian et al.²⁹ suggested that average arm abduction increased from 32° when scanning patients with a BMI on the 50th percentile to 46° when scanning increased BMI (95th percentile) patients.

To minimise arm abduction:

- The examination couch needs to be adjusted to an appropriate position and height to allow for the optimal arm and elbow position.^{23,24} (Image E)
- Whenever possible, the sonographer should keep their forearm horizontal to the floor, allowing the shoulder to remain in a neutral position.⁶
- The patient should be positioned as close as possible to the sonographer.^{6,18}
- It is recommended that sonographers adjust the patient's position whenever possible to improve visualisation. This may include scanning from the lateral decubitus, oblique, semi-recumbent or upright positions to help displace the panniculus for better visualisation. Altering positions may reduce the tissue depth the ultrasound beam needs to penetrate, enhancing image clarity.^{3,18,24,30} Ensure that the bed width allows patients to move safely. It can also be beneficial to engage the patient and ask them to support the panniculus to reduce the weight on the scanning wrist.

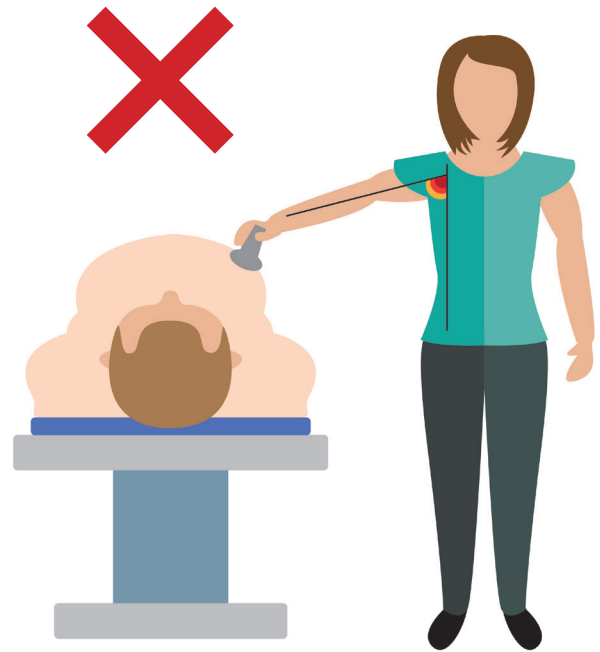


Image E – Bed height too high with excessive arm abduction (top); Low bed height, lunge stance and reduced arm abduction (bottom)

UTILISE ALL MACHINE ASSISTANCE

Ensure you are aware of how to modify your machine to obtain the best quality images efficiently.

Ultrasound machine settings

- Ask equipment manufacturers to set up penetration settings to optimise frequency and harmonics.¹⁸
- As with any ultrasound examination, when scanning a bariatric patient, adjust the gain, contrast, depth, and focus to enhance the visibility of structures through thick layers of subcutaneous fat.
- Use harmonic imaging, if available, to improve image quality. This feature enhances the visualisation of structures through thick tissue layers by reducing background noise.¹³
- Compound imaging can be used to reduce artifacts and improve contrast resolution and tissue differentiation.^{30, 31}
- Speckle reduction filters can also be used to improve the quality and contrast by reducing noise and amplifying the stronger signals to produce a clearer image.^{30, 31}
- Compressing the dynamic range or using alternate image tints may improve image visualisation.

Transducer selection

- Use lightweight transducers that allow a power grip rather than a pinch grip.^{6, 15, 16, 18, 22}
- Large transducers are preferred for ergonomic reasons as they provide a more familiar and natural grip compared to a small transducer; however, smaller transducers can potentially improve the quality of the examination as they allow for better angles and access.²⁵
- Low frequency curvilinear transducers can be used for deeper structures. They offer better penetration through increased tissue thickness and are ideal for assessing deeper organs and structures.¹³
- Small footprint, low frequency transducers may be useful for an intercostal approach to abdominal ultrasounds.

MODIFY YOUR TECHNIQUE

Modifying your scanning technique for bariatric patients is crucial to ensure you scan efficiently and reduce the risk of WRMSD.

- Reduce scan times where possible by targeting the ultrasound examination.³ This needs to be done in consultation with the reporting and referring clinician and well documented.
- If a full examination is required, departments should adhere to appropriate appointment times. Failure to adhere to these minimum appointment times can expose staff to the risk of WRMSDs and increase the potential for medicolegal issues due to errors, misdiagnosis, and work-related injuries. Additionally, insufficient examination time can compromise the quality of examinations, thereby putting patients at risk.³²

- Do not extend the examination time beyond what is normally allowed if there is unlikely to be any extra diagnostic benefit to the study.²⁶ Document clearly what components of the scan could not be successfully completed due to technical challenges.
- Sonographers should utilise cine loop or volume scanning where appropriate to reduce the amount of time scanning.³³
- Bedside ultrasound imaging exacerbates WRMSDs due to limitations in the proper positioning of the ultrasound machine and should only be undertaken when medically necessary.³⁴
- Depending on the examination requested, sonographers could consider scanning immobile patients directly in their beds to minimise the need for patient transfers or assistance with movement. However, this approach has its limitations: hospital beds are wider than examination tables and have restricted movement capabilities, which could pose ergonomic challenges for the sonographer, potentially requiring them to stretch further.

Transvaginal ultrasound

Lack of arm support during transvaginal ultrasound examinations can result in muscle fatigue and shoulder discomfort.³⁵

- Transvaginal imaging should be used where appropriate in bariatric patients to reduce the problem of impaired acoustic windows in pregnancy or gynaecological ultrasounds.^{30, 36}
- To reduce arm abduction, and if practices have equipment available, sonographers may use exam tables with stirrups or those with a foot section that can be lowered, enabling scanning from the foot of the table.²³
- The ultrasound machine should be moved level with the patient's pelvis.
- The sonographer should sit or stand as close as possible to the patient's right leg, reaching around the leg.³⁴ Reaching over the patient's leg puts the sonographer's arm in a restricted and awkward position.³⁴

Obstetric ultrasound

Healthcare facilities should have well-defined pathways for the care and management of pregnant women with obesity.³⁷ There is an increased incidence of congenital anomalies and complications in fetuses of high BMI pregnant women. Therefore, care needs to be taken to visualise fetal structures and assess fetal growth and wellbeing.³¹

- Using the Trendelenburg (head down) position of the ultrasound examination couch can help to improve the visualisation of the fetus when it is positioned low in the maternal pelvis.^{18, 30} However, it is important to note that at later gestations this position can cause aortocaval compression inducing a vasovagal reflex.³⁸ In these cases, an oblique or decubitus position may be more appropriate.³⁸

- Utilise scanning windows above and below the pannus where the subcutaneous tissue is thinner.³⁸
- Colour Doppler is recommended on all patients and can optimise the visualisation of cardiac structures in high BMI pregnant patients.³¹
- A full maternal bladder can push the uterus upwards, improving fetal visualisation.^{30, 31} An empty bladder can also be helpful as it can reduce the scan depth to the fetus.
- Transvaginal scanning can improve the visualisation of structures, in particular, cardiac structures³⁸ and should be utilised if the fetal position is favourable. High BMI patients may benefit from a transvaginal scan at 14–16 weeks to examine early morphology.³³
- Completing morphology examinations at a later gestation can be beneficial,²¹ though this may be influenced by state legislation affecting pregnancy management. A repeat ultrasound two weeks after the initial morphology scan can improve the visualisation of cardiac anatomy and previously unseen structures.^{31, 39}

In cases of suboptimal visualisation, a referral to a tertiary centre may be considered after the scan has been repeated.³⁶ This should be discussed with the duty fellow or consultant at the tertiary institution. However, it is important to note that tertiary sonographers may encounter similar challenges when scanning obstetric patients with a high BMI.

Cardiac ultrasound

- When maintaining an ideal ergonomic posture is not feasible, employing a second sonographer to assist can be beneficial.
- Minimise the number of consecutive bedside examinations to ensure musculoskeletal recovery.
- There may be a low threshold for the use of contrast. Ultrasound-enhancing agents can be used for patients with a high BMI to provide better delineation of cardiac structures and blood flow to provide improved image quality.^{40, 42} This may also reduce the need for more invasive imaging modalities such as CT or MRI, which may be less accessible for high BMI patients.
- Correct positioning of the patient is important

to avoid excessive arm abduction and spinal lateral flexion. Where possible, have the patient lie in a left lateral decubitus position and adjust bed height to accommodate the increased BMI.

PRIORITISE YOUR PATIENT

Patients with obesity are entitled to safe, dignified, and respectful care.^{8, 36, 44} Unfortunately, they may encounter negative attitudes from healthcare professionals, leading to feelings of guilt, shame, and humiliation.^{5, 30, 44, 45} These biases can be conveyed through both verbal and nonverbal behaviour, which may result in patients avoiding healthcare services altogether.⁴⁴ It is essential for healthcare professionals to cultivate empathy and avoid stereotyping when caring for patients with a high BMI.

- Provide appropriately sized gowns to respect the patient's privacy and dignity.⁸
- Be mindful that bariatric individuals often suffer from co-morbidities that might affect their ability to cooperate during an examination.⁸
- Continuously communicate with the patient to ensure they are comfortable and adjust the positioning or technique as needed.
- Inform the patient that adjusting patient position will result in optimal scanning windows to encourage patient cooperation and to move soft tissue contours to minimise transducer to viscera distance.
- Describe the purpose of the ultrasound in appropriate terms for the patient's health literacy. Include any limitations that may reduce the diagnostic accuracy, for example, the size and development of the fetus, and reduction in penetration. This helps set the patient's expectations and reduces anxiety.
- Explain any sensations the patient might experience. For example, 'You might feel some pressure as I press the transducer to get a clear image'.
- Be mindful of the language used but ensure communication is open and truthful. Explain the need for high BMI assistance with patient handling. Patients may feel terms such as 'obesity', 'fat' or 'obese person' convey a negative message²⁸ and could prefer words like 'high body mass index'.

Image documentation and reporting

Sonographers should adhere to professional standards and utilise their expertise in an effort to complete the examination without increasing their risk of WRMSD.

When triaging or performing studies on high BMI patients, it may be beneficial to employ a targeted imaging protocol to answer the clinical question. The reason for the limited study should be clearly documented and discussed with the reporting/supervising clinician. Be aware of potential limitations in image quality due to increased tissue thickness and adjust the interpretation

accordingly. To document any reduced diagnostic ability, it is recommended that the sonographer records the patient's BMI on their worksheet and/or captures an image that demonstrates the depth to region being imaged. This provides context for limitations in image quality due to body habitus, ensuring challenges faced during the scan are clearly documented. If the image quality is compromised or is non-diagnostic, the sonographer should note on their worksheet how the examination was affected and document any additional attempts made to complete the study.^{18, 27, 39}

The language used when reporting findings should be formal, clear, concise, specific, unambiguous, and easily understood.³⁸ Be aware of the patient's feelings when discussing limitations, as reports are frequently being read by patients.^{18, 39} Reports should use language that focuses on the technical limitations rather than attributing the issue solely to patient size, for example, "technical limitations prevented a complete

examination." The final report should state what areas were diagnostic, be clear about what anatomy was not appropriately examined, and make recommendations if repeating examinations will likely add to diagnostic capabilities.³³

DISCLAIMER

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