ACPSEM
Australasian College of Physical Scientists & Engineers in Medicine

1st April 2020

Stacy Goergen,
Chair of RANZCR Safety, Quality and Standards Committee
The Royal Australian and New Zealand College of Radiologists
Level 9, 51 Druitt Street, Sydney 2000 NSW

Dear Stacy,

Re Radiologist Home Reporting while Waiting for Diagnostic Monitors during the COVID-19 Pandemic

In response to RANZCR's request, the attached documents have been developed by the ACPSEM (via our Radiology Specialty Group) for your consideration to recommend temporary reporting monitor requirements due to quarantining and social distancing for COVID-19, in support of home-based work environments.

Please review and let us know whether these documents meet your need. We look forward to receiving the RANZCR-approved final version and our Board will provide formal endorsement of the final version of the recommendations.

If you have any questions regarding the documents, please feel free to contact Amanda Perdomo, Chair of ACPSEM Radiology Specialty Group.

Kind regards

Sharon Flynn
CEO

Suite 7.12, Aero247 Building
247 Coward St, Mascot NSW 2020, Australia
t : +61 (2) 8305 3901 f : +61 (2) 9700 8023 e : admin.support@acpsem.org.au w : www.acpsem.org.au

The ACPSEM Mission is to advance services and professional standards in clinically related physical science and engineering professions for the benefit and protection of patients, staff and the community

Radiologist home reporting while waiting for Diagnostic Monitors during the COVID-19 Pandemic

Contents

Conditions of current recommendation

This document is designed by the ACPSEM (via the Radiology Specialty Group) in response to a request from RANZCR for its consideration to provide Radiologists with a consistent method of self-assessment to determine the suitability of a remote workstation for reporting diagnostic general X-ray, CT, Ultrasound and MRI images with the understanding that:

- Using dedicated, department-based reporting workstations during the COVID-19 pandemic poses a risk of transmitting or receiving viral infection.
- Having remote workstations individually assessed by a Medical Physicist at this time is not practical given physicist availability, and risk of transmitting or receiving viral infection.
- Most Radiologists will not have the equipment available to measure luminance metrics, or to perform monitor calibrations.
- Dedicated reporting workstations that will meet RANZCR Standards of Practice are being procured, but currently have an 8-10-week lead time.
- These guidelines are being suggested as a risk mitigation strategy and are not best practice.

It should be stressed that this process is designed to enable Radiologists to minimise risk of contracting or spreading COVID-19 by enacting social isolation, and strong workplace redundancy practices. This is a temporary solution while primary diagnostic monitor procurement occurs. This should not be considered a long-term solution and relies on constant professional evaluation to ensure that monitors meet minimum clinical requirements.

If available, it is recommended that any remote workstation is assessed to the performance requirements of the RANZCR Standards of Practice, by a qualified professional

Workstation self-assessment recommendations

The following sections outline the tests that are recommended to be performed. These include:

- TG-18QC test pattern at the beginning of each reporting session (approx. 2 min)
- Clinical image quality assessment once only when setting up the remote workstation environment (approx. 30 min)

TG18-QC test pattern

It is recommended that this pattern is uploaded onto the local PACS system, and viewed using their native PACS interface.

The following checklist must be completed at the beginning of each reporting session

General Image Quality	
No smearing	
No artefacts	
Borders and lines of the pattern are visible and straight	
Pattern appears to be centered in the active area of the display device	
Ramps continuous	
Luminance	
All 16 patches are distinctly visible	
5% patch visible	
95% Visible	
Resolution elements visible	
Horizontal line pairs visible	
Vertical line pairs visible	
Central line pairs visible	
Number of Letters Visible (at least 11 or "QUALITY CONT")	
Dark	
Mid-grey	
Light	

Please see attached powerpoint document for further information on assessing the TG18-QC test pattern.

Clinical image quality assessment

Use the RANZCR CT Image Review Self-Audit Worksheets to evaluate 2 images from each category, as appropriate:

- CT Brain
- CT C-Spine
- CT L-Spine
- CT Chest Adult
- CT Chest (Hi-Resolution)
- CT Abdomen & Pelvis

Using the self-assessment checklist, determine if diagnostic quality is acceptably reproduced using home diagnostic workstation.

CT BRAIN DATA

Image Quality Criteria	Scan 1	Scan 2	Scan 3	Scan 4
Visually sharp reproduction of the border between white and grey matter	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Visually sharp reproduction of the basal ganglia	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Visually sharp reproduction of ventricular margins	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Visually sharp reproduction of the CSF spaces over the surface of the brain and within the basal cisterns	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Visually sharp reproduction of large intracranial arteries and dural venous sinuses on contrast-enhanced images	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Visually sharp reproduction of pituitary stalk	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Visually sharp reproduction of the internal auditory canals, on bone windows	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Visually sharp reproduction of cortical bone and calvarial diploic bone, on bone windows	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

General Assessment	Scan 1	Scan 2	Scan 3	Scan 4
Noise	☐ Too little ☐ Optimal ☐ Too much	☐ Too little ☐ Optimal ☐ Too much	☐ Too little ☐ Optimal ☐ Too much	☐ Too little ☐ Optimal ☐ Too much
Spatial resolution	☐ Too little ☐ Optimal ☐ Too much	☐ Too little ☐ Optimal ☐ Too much	☐ Too little ☐ Optimal ☐ Too much	☐ Too little ☐ Optimal ☐ Too much
Diagnostic Quality	☐ Unacceptable ☐ Borderline ☐ Acceptable	☐ Unacceptable ☐ Borderline ☐ Acceptable	☐ Unacceptable ☐ Borderline ☐ Acceptable	☐ Unacceptable ☐ Borderline ☐ Acceptable

Comments

Your clinic can develop a clinically appropriate checklist dependent on the workload and what the reporting expectations are. For example, the Criteria for evaluating the TG18 anatomical images can be used.

General Assessment Comments

If possible, you should review your set of clinical images as well as the TG18-QC test pattern on a dedicated, department-based workstation to understand what the images should look like.

NOTE: if you **DO NOT** meet these criteria, or you are uncomfortable with the diagnostic quality of the clinical images, it does not necessarily mean that your monitors do not meet reporting criteria. You may need to have the settings altered or calibration performed. This can be conducted in consultation with a qualified professional, for example an ACPSEM registered medical physicist

Caution regarding display of DICOM images on consumer monitors

Consumer monitors are not calibrated to the DICOM GSDF standard that is familiar to radiologists. Compared to a diagnostic monitor, the mid level grey shades will appear lighter than expected. In some studies, radiologists may have an expectation for the lightness of a structure (e.g. assessing the echogenicity of the liver on ultrasound). Radiologists should be aware that consumer monitors display mid-level greys slightly differently than diagnostic monitors, and exercise extra caution in interpretation.

Setting up remote reading environment

1. Ambient room lighting should be less than 20 lux. 20 lux should be comfortably dark, but not pitch black, like a reporting room with doors closed and lights completely dimmed. To compare, elevators are typically lit to 100 lux, shopping centres and office areas are typically lit to about 500lux.
2. Only diffuse light sources should be used in the room, and no lights should be directly behind the reader. There should be no light reflections on monitors. Blinds and doors should be closed.
3. Light from various sources scatter off the surface of the display at various angles. Ensure that you position or angle displays to reduce ambient reflection.
4. Using monitor brightness controls set brightness to maximum.

Recommended monitor technical specifications if purchasing monitors for this task

Panel type	IPS-type (not TN)
Matrix size*	A pair of 3MP or a single 8MP for plain film
Monitor size*	A pair of 22" or a single 27" monitor for plain film
Maximum luminance	At least 350cd/m^2
Contrast (max luminance/min luminance)	at least 250:1
Bit depth	at least 8bit, with preference for 10bit or 8bit + FRC
Graphic interface (video-card)	Either a DVI-D (either single or dual-link) or a Display Port. The analogue video interface found in VGA or DVI-A should not be used since the graphic controller and A/D conversion can introduce image degradation.

*If only CT, US and MRI are being reported, this criteria can be relaxed to 3MP and 24" per monitor

Why do we need monitor performance standards?

Current monitor requirements as defined in the RANZCR Standards of Practice v11, appendix D are as follows:

Appendix D – Monitor Specification Table

	CR/DR[e]	CT[e]	Mammography[59]	MRI[e]
Matrix size	≥3 megapixels	≥3 megapixels	≥4.2 megapixels	≥3 megapixels
Max luminance	≥350 cd/m^2	≥350 cd/m^2	≥450 cd/m^2	≥350 cd/m^2
Luminance ratio[a]	≥250:1	≥250:1	≥250:1[c]	≥250:1
Luminance uniformity[b]	≤30%	≤30%	≤30%	≤30%
Bit depth	8 bits	8 bits	8 bits	8 bits
Calibration **L_{min}[f]** **L_{amb}[g]**	GSDF ≤10%[d] ≥1 cd/m^2 <¼ Lmin	GSDF ≤10%[d] ≥1 cd/m^2 <¼ Lmin	GSDF ≤10%[d] ≥1 cd/m^2 <¼ Lmin	GSDF ≤10%[d] ≥1 cd/m^2 <¼ Lmin

[a] L_{max} / L_{min}
[b] (L_{max} – L_{min}) / L_{centre}
[c] 350:1 preferable
[d] Grayscale standard display function
[e] Australian Technical Specification ATS 5816-2013. Digital images for diagnostic and other clinical purposes: Presentation, communication, display and manipulation. Standards Australia.
[f] L_{min} Ambient reflection from monitor minimum luminance
[g] L_{amb} Minimum luminance

More information on each of these performance metrics can be found in the primary reference for this standard: AAPM task group 270.

Drafted by	ACPSEM Radiology Specialty Group
Completed on	1st April 2020
Effective date	1st April 2020
Review date	TBD
Responsible officer	Head of Specialties and CEO
Enquiries	In response to RANZCR request to recommend temporary reporting monitor requirements due to quarantining and social distancing for COVID-19 in support of home-based work environment
Version	1.0

Document History

Version	Date	Author	Reason
1.0	1/04/2020	ACPSEM Radiology Specialty Group	First version