



Guidance on implementing safety checklists for radiological procedures

Second edition

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Foreword

If any radiologist has any doubt as to the importance of checklists for radiological procedures and teamworking in radiology, they only have to be involved in a single incident where the incorrect side or patient has been subject to an intervention or the incorrect procedure has been performed. This was eloquently stated by Dr Tony Nicholson, Dean of the Faculty of Clinical Radiology in *Standards for the NPSA and RCR safety checklist for radiological procedures*, published in 2010 (and superseded by this document).



The best radiologist I ever met was also the one with the saddest career-ending story. Experienced in hundreds of biopsies, he got the wrong side one day. He was busy and distracted. The radiographers and nursing staff watching the routine case didn't interfere because that wasn't their role. He knew what he was doing. One avoidably dead patient in a whole working lifetime and all that goes with it for so many people. That's all it takes to define an otherwise glittering career. A deep breath, a one-minute chat to the team – a reappraisal of what you are doing, how and why. Staff who are empowered, know their role and are part of the team. That's all it takes to avoid the major complication – the one death.

Taken from *Standards for the NPSA and RCR safety checklist for radiological procedures*.

The RCR is extremely grateful to Dr Sam Chakraverty and Dr Raman Uberoi who, with support from Dr Paul Malcolm, have updated the document. The object of the guidance is to offer sensible and relevant advice specific to radiology in the face of often conflicting advice or instruction from elsewhere. The guidance is relevant to non-interventionists doing minor invasive procedures as well as interventional radiologists undertaking more major procedures and includes reference to evolving concepts and the institution of national safety standards for invasive procedures (NatSSiPs) and local safety standards for invasive procedures (LocSSiPs) in England and Wales. It combines and replaces the previous publications, *Guidance for Fellows in implementing surgical safety checklists for radiological procedures* (2013) and *Standards for the NPSA and RCR safety checklist for radiological interventions* (2010), which have now been withdrawn.

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1. Developing a checklist locally

Some form of checklist is required before the performance of any form of invasive procedure on a patient. In England and Wales the use of checklists is now formalised as part of the national and local safety standards for invasive procedures (NatSSIPS and LocSSIPs) which deal with the whole patient journey around an invasive procedure.

The exact content of a checklist is less important than the culture of which it is part. It should be regarded as a safety process rather than a 'checkbox' exercise and an opportunity for all staff to be aware of and contribute to safe patient care.

The checklists used must be relevant and proportionate to the procedures being undertaken. In many complex interventional radiology cases a World Health Organization (WHO) checklist can be used and altered to suit local requirements (Appendices 1 and 2). However more minor procedures may only require a shorter check before starting – an example is available in Appendix 3. Departments should be encouraged to own and proactively adapt the checklist for the requirements of different practice and different areas within the department.

Although the interventional radiological community has by and large bought into the concept of pre-list briefing checklists, there is evidence that problems persist and significant complications and errors are occurring where 'minor' invasive procedures are performed during primarily diagnostic lists in computed tomography (CT) and ultrasound, that is, outside the realms of interventional radiology. This puts patients at risk.

Completion of a checklist before each procedure should not be burdensome or obstructive to the efficiency of the department, and should take minimal time to complete. For a checklist to be effective, all staff involved need to understand the concept and understand its role in improving safety. The secondary benefits of improved team working and communication cannot be overemphasised as drivers of improvements in patient care. Time for training of teams in these concepts and the associated human factors is necessary and required under NatSSIPs.

It is advisable, therefore, that radiology departments:

- Educate staff as to the patient safety benefits of the implementation of a checklist
- Involve all staff working in the department in collaborative development of checklists suitable for local deployment
- Have an open and frank discussion about the merits and obstacles of using the checklist
- Be prepared to implement different versions of the checklist in different areas of the department dependent on the work undertaken there to complement local policies and good practice already in place
- Have a checklist 'champion' in each area of the department to co-ordinate checklist development, implementation and use
- Empower all staff to challenge areas of concern before, during and after procedures
- Audit the use of the checklist in all areas to ensure compliance and correct use.

2. Using the checklist

All staff involved in a procedure must be known or introduced to colleagues and know their role during a particular patient episode. The checklist should be used as a catalyst for a meeting of all team members to discuss the case.

It is essential that a member of the team is identified who takes responsibility for ensuring completion of the checklist and this is clearly stated in the local policies. This individual may be medical or non-medical.

Team members completing the checklist should be the same people that are performing the procedure, even if their involvement may be later on.

If team members are required to change during a procedure there must be a clear handover involving the entire team. This is a particular area of vulnerability.

All members of the team should be involved in the discussions about the case at the time of checklist completion. There should be no absentees, for example to get items of equipment, check results and so on.

3. Checklist design

The RCR and NPSA (now subsumed into NHS Improvement) originally developed a suggested checklist template for image-guided interventions (Appendix 1). The checks described in this template can act as a guide to the final design of any locally adapted checklist. During checklist design, it is essential that it is clear which checks are to be made, when during the process, where (geographically) within the department and by who. A record of the completed checklist should be retained within the patient's notes or scanned electronically onto the computerised radiology management system. It would be advantageous for checklist completion to be documented electronically, but most radiology information systems do not as yet support this.

Examples of locally adapted checklists are given in Appendices 2 and 3.

4. Suggested specific checks

The listed checks are not exhaustive, nor are all required before all procedures. However the following comments may be helpful in checklist design.

Before the procedure

- Have all team members introduced themselves by name and role?
- Has the patient confirmed their identity, the procedure, site and consent?

Comment

This is for the patient to confirm they know what is happening and why. Team members should confirm these details and confirm the procedure to be undertaken.

Checks about room set-up, patient, staff and operator positioning, draping, equipment and imaging required may be included here.

-
- Are all requirements of the *Ionising Radiation (Medical Exposure) Regulations*¹ being met?

Comment

These checks need to be undertaken for any procedure using ionising radiation; that is, the possibility of pregnancy, current vetted request form and so on.

This question is clearly irrelevant for procedures that do not involve ionising radiation and could be omitted for some checklists such as those for ultrasound-guided procedures.

-
- Is the procedural site marked?

Comment

The fundamental principle is that the correct target lesion is treated. Site marking is mandatory for all procedures in which it is possible.

It should be noted that in many endovascular procedures, the treatment site is remote from the access site and may be contralateral, multiple or revised during the procedure. Site marking in such cases can cause confusion before the procedure and during aftercare.

When site marking is not to be used for particular procedures this should be by local agreement. The target side and site and access point(s) should be explicitly discussed and agreed during checklist completion so that all members of the team can confirm the details, for example there may be no need to mark the aorta prior to endovascular aneurysm repair, vessels to be treated via a contralateral or upper limb approach or sites of bleeding identified on previous imaging. If the target organ or access site is to be chosen or changed intra-procedurally (for example, which kidney to drain first in bilateral hydronephrosis), this fact should also be explicitly discussed and agreed during checklist completion. It can be helpful to have a whiteboard in the room to document these details for reference. The use of radio-opaque markers may also be useful.

The sole reliance on intra-procedural imaging to guide intervention without prior discussion of target site (or without explicit discussion that this site will have to be chosen intra-procedurally) represents poor practice and places patients at risk. There are many examples of wrong-side intervention despite imaging findings, even when the pathology is not bilateral.

-
- Is the monitoring equipment check complete?

Comment

Monitoring equipment, especially pulse oximetry, should be regularly checked, known to be working and used on all appropriate patients, especially those who are sedated or elderly. All staff should understand the limitations of pulse oximetry.

-
- Is the anaesthetic machine/anaesthetic monitoring equipment and medication check complete?
 - What is the patient's American Society of Anesthesiologists (ASA) grade?
 - Is there a difficult airway or aspiration risk?
 - Are there any anaesthetic concerns?

Comment

Questions about anaesthesia or sedation could be split off into a separate section for use only if these are undertaken.

-
- Does the patient have a known allergy?
 - Is there an anticipated risk of >500 ml blood loss?

Comment

The purpose of this question is to ensure that for high-risk procedures, intravascular (IV) access and fluid and/or blood resuscitative agents are available.

Have risk factors for bleeding and renal failure been checked?

Comment

Take action where appropriate.

-
- Is the required equipment available?
 - Has reusable equipment been adequately sterilised?
 - Are there any equipment issues or concerns?

Comment

Imaging equipment function, calibration, dose and image-quality issues could be discussed here. The availability of stock and specially ordered disposables should be checked pre-procedure to ensure the procedure can be completed.

-
- Are there any difficult steps or changes to the standard procedure?

Comment

This is crucial in ensuring that the team are forewarned and prepared for anything out of the ordinary. It is important that staff are able to clarify particular issues or concerns during checklist completion or beforehand.

-
- Has appropriate antibiotic prophylaxis been given?

Comment

Where antibiotics are appropriate (national and or local guidance), these should ideally be given within 60 minutes of the procedure starting. Other peri-procedural medication

prescriptions could also be discussed here; for example, analgesics, antispasmodics, anticoagulants, patient-controlled analgesia prescriptions and so on.

-
- Is glycaemic control adequate?
 - Does the patient need intra-procedural warming?
 - Has venous thromboembolism (VTE) prophylaxis been undertaken?
 - Has all essential imaging been reviewed?

Comment

Will this information be available intra-procedurally if necessary?

After the procedure

A short team debrief at the end should be seen as an opportunity to carry out a discussion on the positives and negatives of the procedure to help improve future practice. Sign out procedures should be completed before attendance to the next patient.

- Has the name and the side of the procedure been recorded?

Comment

There should be a procedure note detailing the key aspects of the procedure and any problems encountered.

-
- Have all pieces of invasive equipment used been accounted for?

This question may seem superfluous for percutaneous procedures where there is no wound for devices to be misplaced into. However retained guidewire and catheter problems do exist. For joint procedures with surgical colleagues, it is vital that a device and swab count is made and is correct.

-
- Have all cannulas been flushed or removed?

Comment

Residual sedative and analgesic agents in cannulae can cause major problems after patient has left the department.

-
- Have any implanted devices been recorded?

Comment

For complex devices, this should be recorded in the patient's notes as well as within the department. Part and lot numbers should be recorded in a manner that can easily be retrieved. A computerised system is preferable to paper ledger.

- Have any equipment problems been identified that need to be addressed?

Comment

Will this affect the next patient on the list? Any serious incidents or device failure should be communicated to the trust governance teams and Medicines and Healthcare products Regulatory Agency (MHRA).

- Have instructions for post-procedural care for this patient been agreed?

Comment

There should be clear, brief instructions post-procedure. If these are detailed on a protocol document, this must be clearly stated and the protocol attached to the procedure note. The instructions in the protocol document must be clear and precise and useable for staff who may not be familiar with aftercare if patients are boarded out. When possible, the patient should also be made aware of aftercare procedures.

Further comments

Records of checklist completion and audit (the audit standard and an audit template are available on the RCR website; www.rcr.ac.uk/CRauditlive).

The checklist should act as a catalyst to improved communication, teamwork and patient safety. The presence of a completed checklist in the patient's record (or on an electronic radiology database), does not of itself guarantee safety if the culture of the department does not embrace the ethos of teamwork, collaboration and safety.

In practice, the recording of checklist completion aids in audit and helps in the assessment of safety culture at a departmental (rather than patient-by-patient) level. Hospital trust insurance schemes and remuneration may be partially reliant on evidence of checklist completion.

Audits of compliance with checklist completion should occur regularly. An administrative staff member should be assigned to data collection for these audits. Staff should feel free to suggest improvements.

Meetings to discuss audits of outcomes and complications, attended by all members of the team, are also an essential element of any patient safety system: please refer to the relevant RCR audit template (www.rcr.ac.uk/CRauditlive).

**5.
Sole practitioners**

Where a procedure is being undertaken alone (usually relatively minor image-guided interventions such as fine-needle aspiration [FNA]), the formal completion and scanning of a checklist designed for more complex procedures will appear over-burdensome and is not appropriate. However, it is essential that sole practitioners run through an appropriate short checklist to confirm correct patient, procedure, side and so on before each intervention. The exact content of this should be decided by the practitioner(s) themselves.

6.
Workload

Well-designed checklist systems should not require significant additional time. It can be argued that 'if you are too busy to perform a short check, you are too busy to do the procedure safely'. Under the NatSSIPs there is a mandatory requirement for organisations to allow time for the design, audit and improvement of checklists and for teams to train together to further understand how human factors impact on maintaining safe practice. This process does take time if it is to be done effectively.

Reference

1. Her Majesty's Government. *The Ionising Radiation (Medical Exposure) Regulations 2017*. London: The Stationery Office, 2017.

Suggested reading

1. Haynes AB, Weiser TG, Berry WR *et al*. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med* 2009; **360**: 491–499.
 2. de Vries EN, Prins HA, Crolla RMPH *et al*. Effect of a comprehensive surgical safety system on patient outcomes. *N Engl J Med* 2010; **363**: 1,928–1,937.
 3. Her Majesty's Government. *The Ionising Radiation (Medical Exposure) Regulations 2017*. London: The Stationery Office, 2017.
 4. NHS England. *National Safety Standards for Invasive procedures (NatSSiPs)*. London: NHS England, 2015.
 5. <https://videos.rcr.ac.uk/video/results-from-the-rcr-national-audit-of-safety-checks-in-radiology-interventions-2016> (last accessed 2/1/19)
 6. Ariyanayagam T, Drinkwater K, Cozens N, Howlett D, Malcolm P. UK national audit of safety check for radiology interventions. *BJR* 2018; doi: 10.1259/bjr.20180637.
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Appendix 1. Example of a World Health Organization (WHO) radiological interventions checklist

Before giving anaesthetic (local or general)	ONLY IF GENERAL ANAESTHETIC IS GIVEN	SIGN OUT (To be read out loud)
Have all team members introduced themselves by name and role? <input type="checkbox"/> Yes	TIME OUT (To be read out loud)	Before any member of the team leaves the room
All team members verbally confirm: <input type="checkbox"/> What is the patient's name? <input type="checkbox"/> What procedure, site and position are planned? If general anaesthetic given the two questions above should be moved to the beginning of TIME OUT		Before start of radiological intervention (for example needle to skin)
Has the patient confirmed his/her identity, site, procedure and consent? <input type="checkbox"/> Yes	Anticipated critical events	Registered practitioner/HCA verbally confirms with the team:
Has essential imaging been reviewed? <input type="checkbox"/> Yes	Anaesthetist (if present):	<input type="checkbox"/> Has the name and side of the procedure been recorded?
Are all IR(ME)R requirements met? <input type="checkbox"/> Yes	<input type="checkbox"/> Is the anaesthetic machine check complete?	<input type="checkbox"/> Have all the pieces of invasive equipment used been accounted for?
Is the procedural site marked? <input type="checkbox"/> Yes <input type="checkbox"/> N/A	Does the patient have a difficult airway/ aspiration risk?	<input type="checkbox"/> Have any implanted devices been recorded?
Is the anaesthesia machine/monitoring equipment and medication check complete? <input type="checkbox"/> Yes <input type="checkbox"/> N/A	<input type="checkbox"/> Yes <input type="checkbox"/> N/A	<input type="checkbox"/> Have the specimens been labelled (including with the patient's name)?
Does the patient have a: Known allergy? <input type="checkbox"/> No <input type="checkbox"/> Yes	Registered practitioner/HCA:	<input type="checkbox"/> Have any equipment problems been identified that need to be addressed?
Anticipated risk of >500 ml blood loss (7ml/kg in children)? <input type="checkbox"/> No <input type="checkbox"/> Yes (and adequate IV access/fluids planned)	<input type="checkbox"/> Are there any patient-specific concerns?	Radiologist, anaesthetist and registered practitioner:
Have risk factors for bleeding and renal failure been checked? <input type="checkbox"/> Yes <input type="checkbox"/> N/A	<input type="checkbox"/> What is the patient's ASA grade?	<input type="checkbox"/> Have the instructions for post-procedural care for this patient been agreed?
Has antibiotic prophylaxis been given? <input type="checkbox"/> Yes <input type="checkbox"/> N/A	<input type="checkbox"/> What monitoring equipment and other specific levels of support are required, for example blood?	PATIENT DETAILS
Has VTE prophylaxis been undertaken? <input type="checkbox"/> Yes <input type="checkbox"/> N/A	Has the surgical site infection (SSI) bundle been undertaken	Last name:
Is the required equipment available and in date? <input type="checkbox"/> Yes	<input type="checkbox"/> Yes <input type="checkbox"/> N/A	First name:
Are there any critical or unexpected steps you want the team to know about? <input type="checkbox"/> Yes <input type="checkbox"/> N/A	<ul style="list-style-type: none">▪ Antibiotic prophylaxis▪ Patient warming▪ Hair removal▪ Glycaemic control	Date of birth:
	The checklist is for radiology interventions ONLY	NHS number:*
	This modified checklist must not be used for other surgical procedures	Date of procedure:
	Remember to scan onto CRIS or record checklist has been undertaken	*If the NHS number isn't immediately available, a temporary number should be used until it is

Appendix 2.
Example of a locally adapted checklist

Department of Radiology: Preprocedural Checklist for Complex Interventions

1 Checklist 1
in procedure room prior to patient being brought in

Have all team members introduced themselves by name and role yes

All team members to confirm:

What is the patient's name

What procedure is planned

What equipment and devices are required

What patient and room positioning is needed

Procedure site clearly identified

Consent documentation complete

Aware of patient's allergies

All team members to check: yes no / n-a

Has imaging been reviewed

Are IRMER requirements met

Is there appropriate IV access

Is glycaemic control adequate

Is patient warming adequate

Have all necessary drugs been prescribed and given (eg antibiotics, analgesia, PCA)

Have steps to preserve renal function been initiated (prehydration, CO2 angiography, medication changes etc)

Have steps to prevent excessive bloodloss been initiated (INR & platelets check, FFP, anticoagulants etc)

Is there an infection risk

Are there any anticipated difficulties

Are there any questions

If GA, sedation or regional anaesthesia is to be administered then complete checklist 2 before bringing patient into procedure room

2 Checklist 2
for GA, sedation or regional anaesthesia cases

Anaesthetist / sedationist to check: yes no / n-a

Is all necessary anaesthetic equipment available and checked

Is all required monitoring in place

Are appropriate drugs available

Are blood and other resuscitative agents available if needed

Has an appropriate discharge destination been confirmed

Are there any anaesthetic issues

3 Checklist 3
before patient leaves the angiography suite

All team members to check: yes no / n-a

Implanted devices recorded

Specimens correctly labelled

Post procedural care clearly understood

Have items of stock running low (<2 remaining) been reordered urgently

Are there equipment or procedural problems that need follow-up

Does this procedure require a team debrief
(to address procedural or staffing issues that have gone particularly well or poorly)

NOW SCAN THIS FORM ONTO CRIS

Patient details (or CRIS sticker)

Name

DoB

ID number

Procedure date

Appendix 3.
Example of locally adapted checklist for more minor procedure

Ultrasound biopsy WHO checklist

		Yes	No			
Patient identity checked						
Team introduced						
Procedure checked (including side, site)						
Imaging reviewed						
Written consent obtained						
Oral consent obtained						
Has the patient read and understood the procedure information and all questions have been answered?						
Date of bloods	HB		INR		Platelets	
			Yes	No	N/A	
Anticoagulation medication omitted (Clopidogrel 7 days, Warfarin 5 days, Heparin 1 day)						
Complications recorded						
Specimens and collection form labelling checked						
Radiologist confirmation of checks						

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