**Template: Medication Standing Order**

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| **Adult** | **<GENERIC NAME OF CONTRAST>** **Administration of <Generic name> for body imaging studies using intravenous injection <Consider strengths, manufacturers> *via this Standing Order when the requirements of NSW State Form SMR060.160 have been met.*** |
| **Applicable areas** | Public health organisation imaging departments. |
| **Areas where guideline NOT applicable**  | * All other areas – local health district (LHD) to determine
* Paediatrics, <16 years of age

Changes to this Standing Order must be approved by a radiologist or medical officer. |
| **Authorised clinicians** | Accreditation requirements apply to medical imaging and radiation oncology employed radiographers, nuclear medicine technologists, radiation therapists (i.e. medical radiation scientists) and registered nurses possessing:* AHPRA registration requirements
* successful completion of HETI My Health Learning education module – Contrast Administration
* successful completion of HETI My Health Learning education module – Aseptic Technique
* current basic life support accreditation

**AND*** Registered nurses and medical radiation scientists assessed and deemed to be competent to administer and check IV contrast by the LHD.

In accordance with ***PD2013\_043*** ***Medication Handling in NSW Public Health Facilities*1** Section 7.4: “In the absence of an authorised prescriber, medication administration (or supply for administration where applicable) during routine procedures and under certain programs conducted at or by a facility may be carried out under a standing order.”Section 7.1 PD2013\_043 outlines who can administer contrast media:* Registered nurses, enrolled nurses (certified), but only in accordance with any practice conditions imposed by the person’s place of employment and the endorsements, notations and conditions on the person’s registration.
* Other appropriately trained and accredited staff members may be authorised to administer certain medications and/or diagnostics agents within their context of practice at the particular facility in accordance with local protocols. Examples (which include allied health professionals) are radiographers (contrast) and nuclear medicine technologists (radiopharmaceuticals, contrast).
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| **Order applies to** | Suitable for adult patients (≥16 years) requiring intravenous contrast studies.Where there is a ‘red flag’ for one of the contraindications on the CT Contrast Administration Checklist (***NSW State Form* SMR060.160***)****,*** a radiologist or medical officer must personally prescribe the contrast agent. Patients <16 years of age requires a written prescription and documentation by a radiologist or medical officer. |

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| **Indication** | CT contrast media is a low osmolar iodinated contrast agent only indicated for contrast CT studies. |
| **Contra-indications** | <CONTRAST MEDIA NAME> (iohexol) must not be administered under this Standing Order to patients with known significant hypersensitivity or previous reaction to iodinated contrast media.If a “red flag” is confirmed in the CT Contrast Administration Checklist (NSW State Form **SMR060.160,**a Radiologist / Medical Officer must be consulted, and his / her approval obtained prior to continuing in order to ensure the validity of the Standing Order.**Contrast Induced - Acute Kidney Injury (CI-AKI)**The risk of CI-AKI remains uncertain for patients with an eGFR of less than 45mL/min/1.73m2. (RANZCR, ***Iodinated Contrast Media Guideline,*** 2018)3. In patients with no risk factors and eGFR >60mL/min the risk for CIN (Contrast Induced Nephropathy) is negligible. While there are multiple risk factors identified in the literature6, the most important risk factor is pre-existing severe renal insufficiency (ACR, ***Manual on Contrast Media*** 2018)2.**Table 1 Risk levels for eGFR (estimated Glomerular Filtration Rate)\***

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| **eGFR** | **CIN Risk** |
| >60mL/min/1.73m2 | Negligible risk |
| 30-60mL/min/1.73m2 | Moderate - Low risk |
| <30mL/min/1.73m2 | High risk |

\* *Ad****a****pted from* ***RANZCR 2018, ACR – 2018, Bibliography 1-4.*** |
| **Presentation** | <CONTRAST MEDIA NAME> is a clear, colourless liquid and comes in bottles of 20mL, 50mL, 75mL, 100mL, 125mL, 150mL, and 500mL. <CONTRAST MEDIA NAME> contains <QUANTITY> of iohexol (equivalent to <QUANTITY> of iodine) per mL |
| ***Precautions and adverse effects*** | Patients should be encouraged to drink water the day before and the day of the procedure.Medical imaging staff should avoid performing repeat contrast examinations within 72 hours of the CT contrast procedure where possible.All patients should be monitored for the following disorders. Refer to information based on product used <Insert your LHD/department specific Product Information, PI, HYPERLINK/reference here>. **Note**: The information in the standing order should be dated and reviewed annually to ensure currency.An example of associated risks with IV Contrast Media administration is provided below in italics and are referenced to GE Omnipaque Product Information Sheets (April 2018)5 as the most prevalent contrast media at the time of this review. These conditions should be evaluated before administering IV contrast media: **Hypersensitivity reactions** Contrast media can cause life-threatening or fatal hypersensitivity reactions including anaphylaxis. Manifestations include respiratory arrest, laryngospasm, bronchospasm, angioedema, and shock. Most severe reactions develop shortly after the start of the injection (within 3 minutes), but reactions can occur up to hours later. There is an increased risk in patients with a history of a previous reaction to contrast agent, and known allergies (i.e. bronchial asthma, drug, or food allergies) or other hypersensitivities. Premedication with antihistamines or corticosteroids does not prevent serious life-threatening reactions but may reduce both their incidence and severity.Obtain a history of allergy or hypersensitivity reactions to iodinated contrast agents and always have emergency resuscitation equipment and trained personnel available prior to contrast media administration. Monitor all patients for hypersensitivity reactions. |

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|  | This information must be based on the product information for the product used (determined by LHD). The information below is an example (italics). **Contrast induced acute kidney injury** Acute kidney injury, including renal failure, may occur after parenteral administration of contrast media. Risk factors include: pre-existing renal impairment, dehydration, diabetes mellitus, congestive heart failure, advanced vascular disease, elderly age, and concomitant use of nephrotoxic or diuretic medications, paraproteinaceous diseases, and repetitive and/or large doses of an iodinated contrast agent.To reduce risks:1. Use the lowest necessary dose of <CONTRAST NAME> in patients with renal impairment.
2. Peri-procedure hydration is described in RANZCR3 Recommendation 8:

*In patients with severe renal function impairment (eGFR less than 30 mL/min/1.73 m2) or actively deteriorating renal function (acute kidney injury) careful weighing of the risk versus the benefit of iodinated contrast media administration needs to be undertaken. Consideration should be given to peri procedural renal protection using intravenous hydration with 0.9% saline (see relevant section). However, severe renal function impairment should not be regarded as an absolute contraindication to medically indicated iodinated contrast media administration.*For further information see *NSW Therapeutic Advisory Group (TAG)4,Minimising Medication related Complications in Patients Receiving Intravascular Iodinated Contrast* (<http://www.nswtag.org.au/practical-guidance/> pages 5 and 8)1. Do not use laxatives, diuretics, or preparatory dehydration prior to contrast media administration.
2. *Where possible, avoid repeat contrast examinations 72 hours outside of the CT contrast procedure.*

*5. Be aware of current nephrotoxic drugs being taken by the patient**SGLT2 inhibitor* *Use of SGLT2 (Sodium-glucose co-transporter 2)**inhibitors as a single ingredient or in combination with metformin may increase the risk of dehydration or renal impairment (Ref: Peri-operative risk of SGLT2 inhibitor-associated ketoacidosis. Clinical Excellence Commission Safety Notice 005/189.*SGLT2 inhibitors are * Dapagliflozin
* Empagliflozin
* Ertugliflozin

**Cardiovascular adverse reactions**Life-threatening or fatal cardiovascular reactions including hypotension, shock and cardiac arrest have occurred with the parenteral administration of contrast media. Most deaths occur during injection or five to ten minutes later, with cardiovascular disease as the main aggravating factor. Cardiac decompensation, serious arrhythmias, and myocardial ischemia or infarction can occur during coronary arteriography and ventriculography.Based upon clinical literature reported deaths from the administration of iodinated contrast agents range from 6.6 per million (0.00066%) to 1 in 10,000 (0.01%). Use the lowest necessary dose of contrast media in patients with congestive heart failure and always have emergency resuscitation equipment and trained personnel available. Monitor all patients for severe cardiovascular reactions.*Extravasation and injection site reactions* Extravasation of contrast media during intravascular injection may cause tissue necrosis and/or compartment syndrome, particularly in patients with severe arterial or venous disease. Ensure intravascular placement of catheters prior to injection. Monitor patients for extravasation and advise patients to seek medical care for progression of symptoms.*Thyroid storm in patients with hyperthyroidism* Thyroid storm has occurred after the intravascular use of iodinated contrast agents in patients with hyperthyroidism, or with an autonomously functioning thyroid nodule. Evaluate the risk in such patients before use of contrast media. *Severe cutaneous adverse reactions*Severe cutaneous adverse reactions (SCAR) may develop from 1 hour to several weeks after intravascular contrast agent administration. These reactions include Stevens-Johnson syndrome and toxic epidermal necrolysis (SJS/TEN), acute generalized exanthematous pustulosis (AGEP) and drug reaction with eosinophilia and systemic symptoms (DRESS). Reaction severity may increase and time to onset may decrease with repeat administration of contrast agents; prophylactic medications may not prevent or mitigate severe cutaneous adverse reactions. Avoid administering contrast media to patients with a history of a severe cutaneous adverse reaction to contrast media.For the management of adverse events please refer to local procedures. |
| **Important drug interactions** | **Metformin**In patients with renal impairment, metformin can cause lactic acidosis. Iodinated contrast agents appear to increase the risk of metformin-induced lactic acidosis, possibly as a result of worsening renal function.Metformin should be ceased for patients with unknown recent eGFR or eGFR <30ml/min/1.73m2 OR who are acutely unwell or have deteriorating renal function. In these cases, metformin should be ceased at least 48 hours from the time of examination and an eGFR performed prior to restarting the metformin.If eGFR is >30 ml/min/1.73m2, metformin does not need to be ceased (Ref: The Royal Australian and New Zealand College of Radiologists, Faculty of Clinical Radiology (2018) Iodinated Contrast Media Guideline)3**Radioactive iodine**Administration of iodinated contrast agents may interfere with thyroid uptake of radioactive iodine (I 131 and I-123) and decrease therapeutic and diagnostic efficacy in patients with carcinoma of the thyroid. The decrease in efficacy lasts for 6-8 weeks.**Beta-adrenergic blocking agents**The use of beta-adrenergic blocking agents lowers the threshold for and increases the severity of contrast reactions and reduces the responsiveness of treatment of hypersensitivity reactions with adrenalin (epinephrine) Because of the risk of hypersensitivity reactions, use caution when administering contrast media to patients taking beta-blockers.Cardio-selective Beta Blockers are considered safe for CT Coronary Angiograms and deemed essential for lowering of blood pressure for these procedures.**Effect on thyroid tests**If iodine-containing isotopes are to be administered for the diagnosis of thyroid disease, the iodine-binding capacity of thyroid tissue may be reduced for up to two weeks after contrast medium administration. Thyroid function tests that do not depend on iodine estimation, e.g. T3 resin uptake or direct thyroxine assays, are not affected.**Interleukin-2 therapy**The RANZCR College Guidelines (2018), Recommendation 28 states:*Patients currently taking or who have finished IL-2 therapy in the past 6 months should be cautioned regarding a possible mild increase in the risk of a delayed anaphylactic contrast media reaction. No further precautions are required.* |

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| **Dosage guideline** | <CONTRAST MEDIA NAME>: *XXX* Milligram/mL, (based on product information)7<Specific procedures may have specific amounts – to be defined by LHD>8In the event the dose given to the patient exceeds the limits set by this standing order, a verbal order for the additional volume can be performed by the radiologist or medical officer treating the patient (where a radiologist is not available). This should be followed by electronic or paper confirmation of contrast dose and volume within the patient’s health record within 24 hours by the ordering radiologist/medical officer. |
| **Duration of therapy** | Each PRESCRIPTION is individually ordered (once only).  |
| **Administration instructions** | Administration should be according to the product information for the product used (determined by LHD). The information in the standing order should be dated and reviewed annually to ensure currency. The below information is an example (italics). *Visually inspect <CONTRAST MEDIA NAME> for particulate matter and/or discoloration, whenever solution and container permit. Do not administer <CONTRAST MEDIA NAME> if particulate matter and/or discoloration is observed.**Determine the volume and concentration of <CONTRAST MEDIA NAME> Injection to be used taking into account factors such as age, body weight, size of the vessel and the rate of blood flow within the vessel; consider also extent of opacification required, structure(s) or area to be examined, disease processes affecting the patient, and equipment and technique to be employed.* *Warming <CONTRAST MEDIA NAME> to body temperature shortly before administration may help improve tolerability and ease of injection.*The rate of administration will be determined by patient weight, scan type, venous access device and patency of peripheral intravenous cannula (PIVC). For patient safety, the aim is to administer at the lowest possible rate necessary to provide optimum image quality.  |
| **Compatibilities** | Although no incompatibility has been found, <CONTRAST MEDIA NAME> should not be directly mixed with other drugs. A separate syringe should be used and the injection needle should be flushed between administrations of <CONTRAST MEDIA NAME> and other drugs with sodium chloride 0.9%. |
| ***Standing order*** | (Ref: RANZCR, 2018)

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| Scan/region to be examined | Medication | Route | Dose | Rate | Frequency |
| *e.g. Abdomen* | <CONTRAST MEDIA NAME>  *(iohexol)* | *Intravenous* | *75 mL (<90 kg)**100 mL (>90 kg)* | *1.8-3.0 mL/s Power injected via limiting device* | *Stat* |
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| **Monitoring requirements** | The patient must be monitored for adverse effects/interactions for at least 15 minutes after the administration of IV contrast BEFORE the removal of the cannula, as most adverse reactions occur in this time.Patients identified to be at a greater risk of reaction require extended monitoring of up to 15-30 minutes depending on the procedure.  |
| **Management of complications** | Management of complications should be determined by LHD and according to the product information for the product used.**Allergic or anaphylactic reactions.** Allergic and anaphylactic reactions should be assessed and treated on their severity in accordance with the relevant local guidelines.**Adverse reactions**If any adverse reactions are observed during administration:1. Cease administration immediately (if in progress)
2. Call for assistance including request for urgent medical assistance
3. Leave the cannula in situ
4. Provide basic life support

The full management of anaphylactic iodinated contrast reaction is also described in the RANZCR iodinated Contrast Media Manual, page 29, 2018: *R55. Adrenaline (epinephrine) is potentially life-saving and must be used promptly. Withholding Adrenaline (epinephrine) due to misplaced concerns of possible adverse effects can result in deterioration and death of the patient.***Delayed reactions**The RANZCR (2018) states: *Late adverse contrast media reactions occur between one hour and one week after intravascular iodinated contrast media administration. These are typically skin reactions with a maculopapular rash being most common. Less frequent skin reactions include angioedema, urticaria and erythema and painful salivary gland swelling. Delayed contrast media reactions are not typically associated with bronchospasm or laryngeal oedema.**The effectiveness of premedication with corticosteroids in reducing the incidence of recurrent delayed contrast media reaction is unknown. The incidence of reported late adverse reactions varies in the literature but is likely to be 4% or less. There is a possible increased incidence of late reactions to iodinated contrast media in patients who have received interleukin-2 (IL-2).***Extravasation**Extravasation of a contrast medium during intravascular injection may cause tissue necrosis and/or compartment syndrome, particularly in patients with severe arterial or venous disease. Ensure intravascular placement of catheters prior to injection. Monitor patients for extravasation and advise patients to seek medical care for progression of symptoms. (Ref: GE Omnipaque Product Information Sheets, April 2018)5. If contrast media extravasation occurs, conservative treatment with limb elevation, cold or warm compresses and monitoring for compartment syndrome is recommended. Surgical referral is required if compartment syndrome should develop. Specific documentation of the adverse event is required as per LHD policy/procedure.**Management of CIN Complication**Please see Precautions and Adverse Effects section. CIN occurs after the patient has left the Medical Imaging department, thus managed via local procedures/protocols8. Refs: 1. Iodinated Contrast Media Guideline RANZCR 201832. NICE Guideline Preventing contrast induced acute kidney injury.6 <http://www.nice.org.uk/guidance/cg169/evidence> |
| **CT IV documentation recording** | Documentation must be undertaken as per legal requirements and LHD policy. Record the administration in the eMEDs (or equivalent) function of the patient’s health record, including strength, batch number, volume, route of administration and the performing staff member.Patient (consumer) information on CT Scans with/without Contrast must be provided to the patient together with the opportunity to answer any questions. Documentation that this has occurred exists on the CT Contrast Administration Checklist (*NSW State Form* **SMR060.160***)*The CT Contrast Administration Checklist is to be placed in the paper file and/or scanned into the relevant health record at completion of the examination. The paper file can act as a contingency when networks are down.Any adverse events must be: * notified to the prescriber
* being documented in the alerts in the clinical information system
* documented in the radiology report and/or patient healthcare record
* entered into IIMS as a clinical incident with principal incident type – medication
* reported to the TGA by completing a ‘'Blue Card'’ (Adverse Drug Reactions Advisory Committee) and providing a copy to Pharmacy
* reported to the pharmaceutical company.

A letter should be provided to the GP/referrer including the radiologist report and any adverse reactions. |
| **Standing order review** | The information in the standing order must be dated and reviewed annually to ensure currency. |

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| **References and Bibliography** | **References**1. PD2013\_043 Medication Handling in NSW Public Health Facilities (under review**)**
2. American College of Radiology, ACR,*Manual on Contrast Media* 2018
3. Iodinated Contrast Media Guideline. (2018) *The Royal Australian and New Zealand College of Radiologists, Faculty of Clinical Radiology*
4. Minimising Medication related Complications in Patients Receiving Intravascular Iodinated Contrast (2018) *NSW Therapeutic Advisory Group (TAG).* <http://www.nswtag.org.au/practical-guidance/>
5. *GE Product information online:* Precautions and Adverse effects OMNIPAQUE™ (iohexol) Product Information. (2018)

[*http://www3.gehealthcare.com/~/media/documents/us-global/products/contrast-media\_non-gatekeeper/clinical-product-information/omnipaque/gehealthcare\_omnipaque-bulk-pack-prescribing-information\_032012.pdf?Parent=%7B21C1FA0B-7909-4C09-90C6-0FD83A4D7E61%7D*](http://www3.gehealthcare.com/~/media/documents/us-global/products/contrast-media_non-gatekeeper/clinical-product-information/omnipaque/gehealthcare_omnipaque-bulk-pack-prescribing-information_032012.pdf?Parent=%7B21C1FA0B-7909-4C09-90C6-0FD83A4D7E61%7D)1. NICE Guideline Preventing contrast induced acute kidney ACCESSED on 25 5 2019 injury.<http://www.nice.org.uk/guidance/cg169/evidence>
2. Other CM product information based on LHD nominated product < PRODUCT NAME (accessed date: XX XX 20XX) >
3. *ANY LHD specific policy sites < INSERT> ANY LHD specific sites < INSERT>*
4. Peri-operative risk of SGLT2 inhibitor-associated ketoacidosis. Clinical Excellence Commission, CEC Safety Notice 005/18

**Bibliography**1. Risk of Intravenous Contrast Material–mediated Acute Kidney Injury: A Propensity Score–matched Study Stratified by Baseline-estimated Glomerular Filtration Rate McDonald et al Radiology: Volume 271: Number 1—April 2014.
2. The High Risk of Contrast-induced Nephropathy in Patients with Suspected Pulmonary Embolism Despite Three Different Prophylaxis: A Randomized Controlled Trial Turdei et al Academic Emergency Medicine 2016; 23:1136–1145
3. Prophylactic hydration to protect renal function from intravascular iodinated contrast material in patients at high risk of contrast-induced nephropathy (AMACING): a prospective, randomised, phase 3, controlled, open-label, non-inferiority trial The Lancet February 20, 2017
4. Risk of Acute Kidney Injury After Intravenous Contrast Media Administration Hinson et al Ann Emerg Med. 2017.
5. Pregnancy and Breastfeeding Medicines Guide: The Royal Women’s Hospital, Victoria Accessed 9 Oct 2018 at *https://the womenspbmg.org.au/*
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| **Groups consulted** | * Agency for Clinical Innovation, Radiology Network and Nuclear Medicine Network
* Pharmaceutical Services Branch, Ministry of Health
* Clinical Excellence Commission, Medication Safety Expert Advisory Committee (MSEAC)
* Royal Australian and New Zealand College of Radiologists
* NSW LHDs (Distribution to LHD Drug and Therapeutics Committee/Quality Use of Medicines Committees, Imaging Departments and other relevant departments)
* NSW Therapeutic Advisory Group (TAG)
* NSW Consumer Council (for related information sheets and checklist)
 |
| **Key words** | Contrast media, contrast agent, CT contrast, Radiocontrast, Intravenous contrast examinations, Contrast induced AKI, Contrast induced nephrotoxicity, iohexol, < Contrast Media name> |
| **Summary of changes if replacing an existing document** | N/A |
| **Related legislation** | Related legislation (including OHS legislation), Australian Standards, NSW Health Policy or Circular, other LHD documents, Professional Guidelines, Codes of Practice or Ethics:* Poisons Act and Regulations
* PD2013\_043 – Medication Handling in NSW Public Health Facilities
* NSW Health Policy Directive PD2014\_036 Clinical Procedure Safety
* Nurse and Midwife Initiated Medicines PD2013\_043:PCP 4 (for NIM, MIM and N/MIM only)
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