Intravenous Cannulation and Injection Course
For Radiographers and Radiation Therapists

April 23rd and 24th 2015 Brookfield Health Sciences Complex, UCC

Organised by Radiology Education Subgroup HSE South/South West and CPD Department, Medical Education Unit, School of Medicine, UCC.

Lectures (L) and Practical Sessions (P) Course Content

- Anatomy of the Upper and Lower Limb Vascular System. (P)
- Physiological Principles of Fluid Balance and Contrast Solutions. (L)
- Iodinated Contrast Agents (L)
- Contrast Agents - Adverse Reactions and Management; Patient Selection and Groups at Risk (L)
- Anaphylaxis – Pathophysiology, Aetiology and Management (L)
- MR contrast agents
- Contrast Administration – Other Hazards including Local Trauma
- Safe Use of Radiopharmaceuticals in Nuclear Medicine. (L)
- Intravenous Cannulation and Injection – Legal and Ethical Considerations (L)
- Intravenous Administration and Injection – Professional Practice Issues and Departmental Protocols. (L)
- Intravenous Access – Infection Prevention and Control (L)
- Intravenous Cannulation – Technique (P)
- Power Pump Injectors. (L+P)
Learning Outcomes

On completion of the course the radiographer or radiotherapist will be able to:

2. Demonstrate an awareness of the medico-legal aspects of performing intravenous injections.
3. Demonstrate the ability to evaluate risk groups and patient suitability for intravenous injections.
4. Demonstrate understanding of the pharmacological and physiological principles of intravenous preparations administered in diagnostic or therapeutic imaging.
5. Establish and implement Departmental Protocols for the administration of intravenous injections by radiographers and radiotherapists. Know the role of the radiographer in the administration of intravenous injections.
6. Explain and implement Patient Safety and Infection Control precautions associated with intravenous injections.
7. Perform intravenous cannulation and intravenous substance administration in the simulated setting.
8. Know how to connect and operate a power pump injector.
9. Be able to recognise and deal appropriately with adverse reactions to intravenous administration.

Anatomy of the Vasculature System Upper and Lower Limbs

Format: Practical Session with Introductory Presentation

Lecturer: Lecturers/Demonstrators, Dept. of Anatomy and Neuroscience, UCC.

Learning Outcomes
- Demonstrate knowledge of the micro-structure of veins and arteries
- Demonstrate knowledge of the vasculature system of the Upper Limb and Lower Limb

This teaching session will be delivered in UCC’s state of the art FLAME Anatomy Lab by UCC School of Medicine Anatomy Department staff. Teaching will practical-
based and will include prospected specimens and advanced technological visual displays.

Content:
- Microstructure of veins (Histology). Tunica Intima, tunica Media and tunica Externa.
- Difference between the structure of veins and arteries.
- Valves in veins – structure and function.
- Factors governing the direction of blood flow and venous return to the heart.
- The Venous Tree – venous sinuses, deep veins, superficial veins, venules
- Vasculature System Upper Limb
- Vasculature System Lower Limb

Physiological Principles of Fluid Balance and Contrast Solutions

Format: Lecture

Learning Outcomes
- To demonstrate knowledge of the principles of body fluid compartments including intracellular fluid and extra-cellular fluid and normal body fluid homeostasis.
- To recognize the symptoms associated with different degrees of fluid loss.
- To define hypertonicity, isotonicity and hypotonicity and demonstrate understanding of the physiological effects of administering intravenous isotonic and hypertonic solutions.
- To identify the factors affecting the excretion of contrast media.
- To demonstrate knowledge of the role of the blood brain barrier in relation to media injection.

Content:
- Body Fluid Distribution
- Extra-Cellular Fluid (ECF) and Intra-Cellular Fluid (ICF)
- Regulation of Body Fluid
- Percentage fluid loss and correlation with symptoms
- Solution Osmolarity and Tonicity – hypertonic, isotonic and hypotonic solutions
- Physiological effects of administering isotonic and hypertonic solutions
- Cell Transport – Active and Passive. Diffusion. Osmosis. Active cell transport
- Blood Brain Barrier – structure, function, factors affecting transport across blood brain barrier
- Physiological properties of contrast media
- Excretion of contrast media
- Renal effects of contrast media
- Effects of impaired renal function on contrast excretion

**Iodinated Contrast Agents**

**Format:** Lecture

**Learning Outcomes**

- To demonstrate knowledge about the types of iodinated contrast agents and indications for use.
- To be able to explain the role of contrast agents in imaging.
- To demonstrate knowledge of the physiological principles behind the action of contrast agents.
- To know the process for timing in injecting iodinated contrast agents.

**Content:**

- What is a contrast agent?
- Development of non-ionic contrast media
- Why do we need to use contrast agents?
- New developments - comparative advantages and disadvantages
- Flow rates, volumes and phases of imaging of iodinated contrast agents
- Role of the carrier agent in contrast media

**Anaphylaxis and Management of Patient with Anaphylaxis**

**Format:**

- Presentation

**Learning Outcomes**

- To be able to define anaphylaxis, anaphylactoid reaction, and know the incidence of anaphylactic reactions to intravenous contrast agents.
- To identify the causes of anaphylaxis.
- To demonstrate knowledge of the underlying pathophysiology (mechanisms) of anaphylactic reactions.
- To outline the clinical signs and symptoms associated with anaphylaxis.
- To know how to manage anaphylactic reactions in the Radiology Department setting.
- To be familiar with the drugs and equipment in the Emergency Trolley.

**Content**

- Best Practice Radiology Department Guidelines/Protocols for Contrast Injections.
- Non-idiosyncratic reactions (chemotoxic, dose-related).
- Idiosyncratic reactions (anaphylactic).
- Pathogenesis of anaphylactic reactions including the role of antigens and antibodies, mast cells, histamine etc.
- Clinical presentation of anaphylaxis (signs and symptoms).
- Delayed reactions. Bi-phasic anaphylactic reactions.
- Factors affecting the presentation of anaphylactic reactions.
- Management of severe reactions – use of adrenaline and recommended doses.
- Practical considerations in management of anaphylaxis in the Radiology Department.
- Emergency equipment and drugs.
- Measures to prevent anaphylaxis.

**Contrast Administration – Other Adverse Effects**

**Format:** Presentation

**Learning Outcomes**

- To be able to identify when a patient is having an adverse reaction to contrast media.
- To be able to identify patients at high risk of having a contrast reaction.
- To know how to manage an adverse reaction.
- To be able to demonstrate knowledge of the side effects of contrast agents in (renal, cardiovascular, respiratory and neurological systems).
- To recognize when extravasation has occurred and how to treat it.
- To know the First Aid treatment of syncope (fainting).

**Content**

- Identification of at-risk patients and management strategy.
- Considerations in special populations.
- Identifying patients at risk of adverse reactions to contrast media and their management.
- Renal effects of contrast agents.
- Cardiovascular Effects of contrast agents.
- Neurological effects of contrast agents.
- Respiratory Effects of contrast agents.
- Immediate management of extravasation.
- Extravasation incident form.
- First Aid treatment of Syncope.
Safe use of Radiopharmaceuticals in Nuclear Medicine

Format: Lecture

Learning Outcomes

• To understand the legal framework and regulations for Radiation Safety in the workplace.
• To know the key principles of Radiation Protection including the preparation, transport and administration of radio-pharmaceuticals.

Course Content

• Legal Framework /Local Regulations for Radiation Safety
• Local Regulations re Pregnancy
• Controlled and Supervised Areas/Classified Workers
• Occupational Dose Limits - Use of Thermoluminescent Dosimeters (TLDs)
• Radiation Protection – Time, Distance, Shielding
• Preparation of Radio-Isotope Materials/use of Tungsten Syringe Shield
• Transporter Boxes
• Radio-pharmaceutical Injection Methods
• Special Considerations – Isotope lung scans, Isotope MUGA scans, I\(^{123}\) MIBG Isotope Renograms, PET scans.
• Transport of Radio-Isotope materials

Intravenous Cannulation and Injection – Legal and Ethical Considerations

Format: Lecture

Learning Outcomes

• To be familiar with the legal aspects relating to radiographer intravenous cannulation/injection including informed consent, record-keeping and incident reporting.
• To understand the importance of confidentiality in the clinical encounter.

Course Content

• Negligence. Duty of Care
• Insurance Cover
• Informed Consent
• Record-keeping
Intravenous Administration and Injection – Professional Issues and Protocols

Format: Lecture

Learning Outcomes:

• To be familiar with national and local frameworks and protocols for Radiographer intravenous cannulation and injection.
• To know how to report an adverse incident
• To understand the importance of clinical audit and CPD in the area of intravenous cannulation/injection.

Content:
IIIRT Guidelines for Radiographer Intravenous Cannulation and Injection.
Hospital Intravenous Administration Protocol
• Radiographer protocol
• Substances protocol
• Intravenous pump protocol
• Patient consent
• Pre-injection checklist
• Clinical supervision
• Procedure for failed venepuncture
• Procedure for managing adverse reactions
• List of accredited radiographers

Health and Safety considerations
Incident Reporting
Clinical Audit, CME, CPR Refresher

Intravenous Cannulation Devices and Infection Control

Format: Lecture/Presentation

Learning Outcomes:

• To be able to recognize the risk factors for developing infection as a complication of intravenous cannulation
• To recognize the signs of infection
• To know and be able to demonstrate the Aseptic Non-Touch Technique
• To know how to reduce risk of infection during intravenous line insertion/line manipulation and how to prevent infusate contamination.
• To demonstrate knowledge of safe disposal of sharps
• To know what to do in case of needlestick injury

Content:
• Prevalence of Blood Stream Infections associated with intravenous devices
• Factors Associated with increased risk infection
• Local and Systemic Infection
• How to prevent infection during line insertion
• How to prevent infection during IV line manipulation (Aseptic Non-Touch Technique)
• Safe injection practices
• Preventing infusate contamination
• Signs of infection
• What to do if infection suspected
• Intravenous line care policies
• Sharps Disposal
• Needle stick injury

Intravenous Cannulation – Technique

Presentation and Demonstration: Practical Session

Learning Outcomes:
• To be able to demonstrate how to correctly insert an intravenous cannula while considering infection control guidelines and patient safety.
• To demonstrate the ability to dispose of sharps and contaminated material safely.

Content:
• Step by step Guide on how to correctly and safely perform intravenous cannulation.
Power Pump Injectors

Format:

- Presentation including viewing of a video demonstrating use of the power pump.
- Practical demonstration where students gain practice in attaching the intravenous line to the power pump.

Learning Outcomes:
To demonstrate the ability to operate a power pump injector including how to attach the pump to an intravenous line, set flow rates, and turn off.

Content:

- How power pump injectors work – parts and function.
- How to attach a power pump injector to an intravenous line.
- How to calculate dose and flow rate.
- How to turn off the pump.
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<tbody>
<tr>
<td>08.45</td>
<td>Registration</td>
<td>Foyer (BHSC)</td>
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<tr>
<td>09.00</td>
<td>Opening and Welcome</td>
<td>Room 301</td>
<td>Niamh Moore, Prof Michael Maher, Dr Bridget Maher</td>
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<tr>
<td>09.15-10am</td>
<td>Physiological Principles of Fluid Balance and Contrast Solutions</td>
<td>Room 301</td>
<td>Prof. Michael Maher</td>
<td>Lecture</td>
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<td>10.00-11.30</td>
<td>Anatomy of the Vasculature System Upper and Lower Limbs</td>
<td>FLAME Anatomy Lab Western Gateway Building</td>
<td>Lecturers, Demonstrators Dept. Anatomy</td>
<td>Practical</td>
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<tr>
<td>11.30</td>
<td>Coffee</td>
<td>BHSC Cafe</td>
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<tr>
<td>11.45-12.30</td>
<td>IV Access Infection Prevention and Control</td>
<td>Room 301</td>
<td>Aine Connolly</td>
<td>Lecture</td>
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<td>12.30</td>
<td>Medico-Legal Considerations</td>
<td>Room 301</td>
<td>Dr Kieran Doran</td>
<td>Lecture</td>
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<td>13.00</td>
<td>Contrast Agents - Anaphylaxis</td>
<td>Room 301</td>
<td>Dr Max Ryan</td>
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<td>13.30</td>
<td>Lunch</td>
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<td>14.00</td>
<td>Iodinated Contrast Agents</td>
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<td>MR Contrast Agents</td>
<td>Room 301</td>
<td>Infection Control Nurse</td>
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<td>15.00</td>
<td>Contrast Agents – Adverse Reactions, Patient Selection.</td>
<td>Room 301</td>
<td>Dr Maria Twomey</td>
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<td>15.30</td>
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<td>15.45pm</td>
<td>Safe use of Radiopharmaceuticals in Nuclear Medicine</td>
<td>Room 301</td>
<td>Shane Hayes</td>
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<td>16.15pm</td>
<td>Power Injection Pumps</td>
<td>Room 157</td>
<td>Bernard O’Brien</td>
<td>Practical Demonstration</td>
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<td>16.45</td>
<td>Discussion and Close</td>
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### Friday 25th April

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<td>IV Cannulation Technique</td>
<td>156/157</td>
<td>Aine Connolly</td>
<td>Presentation</td>
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<td>09.45</td>
<td>IV Cannulation</td>
<td>156</td>
<td>Aine Connolly Dr Rob Gaffney</td>
<td>Practical</td>
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<td>Sinead Kingston Brid Normoyle</td>
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<td>11.45</td>
<td>IV Cannulation Practice</td>
<td>156</td>
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<td>13.30</td>
<td>Best Practice Guidelines and Hospital Protocols</td>
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<td>Niamh Moore</td>
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<td>14.00</td>
<td>Discussion and Feedback</td>
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