Managing the risks when manipulating injectable medicines

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The first stop for professional medicines advice

Managing patient safety risks when manipulating injectable medicines

- **Safe use of injectable medicines is a system-wide issue**
- Requires collaboration, governance and practical risk management
- Governance of manipulating injectable medicines
  - Is concerned with assessing risk of error or contamination, the potentially hazardous nature and increasing complexity of injectable medicines, & determining the most appropriate location for preparation
- **Wider engagement with clinical governance and safety teams is crucial!**
  - Practising the wider aspects of 'QA'. Everyone who works with medicines works in QA!
  - Organisational leadership for medicines safety
  - Bridge between clinical and technical teams
    - Understanding clinical realities, translating quality and safety principles into practice, supporting implementation across organisations

Managing the risks of manipulating injectable medicines

- Risks cannot be managed by one team alone
- Safe practice depends on:
  - Chief Pharmacists and pharmacy teams
  - Medicines Safety Officers (MSOs)
  - MHRA
  - Medusa monograph authors
  - Specialist Pharmacy Service (SPS)
  - Local medicines safety, technical and quality assurance teams
  - Clinical teams

Patient safety is strengthened through active, constructive, sustained collaboration across the system

A long-recognised challenge

- Ideally all injectable medicines should be prepared in pharmacy aseptic services
  - Same message since1970s.

  However
  - Aseptic services capacity limitations have existed for decades
  - Increasing demand on aseptic services:
    - Cytotoxic preparations
    - Hazardous or complex medicines
    - Parenteral nutrition (high risk of microbiological contamination)
    - Clinical trial activity

Injectable medicines often need to be manipulated outside pharmacy services and therefore must be managed safely.

Organisational decision making is required to optimise the use of limited aseptic capacity.

Drivers for new guidance from SPS

- NPSA Patient Safety Alert 20 (2007) risk assessment tool was archived and no longer readily available, no longer well-known
- Work in the ATMP group highlighted an ongoing need
- Significant changes in healthcare environment since then:
  - New and novel medicines
  - Rising medicine costs
  - Sustainability and waste reduction responsibilities
  - Expanding service demands
  - Increasingly limited pharmacy aseptic services capacity

Additional complexity and changing medicines landscape

- Challenging presentations e.g. ultra-low temperature storage, multiple vials

Existing guidance needed modernisation for today's healthcare environment

Who developed the guidance

- A collaborative SPS programme
- QA-led development
- Pan-SPS contributions, including Medicines Use and Safety team
- Input from:
  - Medusa monograph authors (user-driven)
  - Front-line users and stakeholder feedback

When to use risk assessment tool

- When a new injectable medicine is introduced
- When SmPC instructions change
- As part of a holistic medicine governance process

- The tool supports
  - Assessment of licensed, unlicensed and investigational medicines
  - Local decision-making on preparation location
  - Mitigation of risks for immediate-use preparation
  - Interpretation of risk factors in Medusa guidance
  - Assessment of the final administered product



Specialist Pharmacy Service

Risk Assessment Tool: Preparation of Injectable Medicines

Before using the tool users please read the supporting information Assessing risks when reconstituting injectable medicines (SPS page)

	Risk factors	Description of individual risks	Allocated score	Score if applicable
1	Therapeutic risk	There is a significant inherent risk of patient harm if the injectable medicine is not prepared and/or administered as intended		**1**
2	High risk route of administration	Examples include intra-ocular, intrathecal, intracerebral, epidural, intraosseous etc.		**10**
3	Use of a concentrate	Where further dilution after reconstitution is essential for safe administration use, i.e. when slow iv injection of undiluted medicine is not appropriate and/or potentially harmful		3
4	Complex calculation	Any calculation with more than one step required for preparation and/or administration		**1**
5	Complex method	Complex preparation method - tick all in the list below that apply	**N/A**	**N/A**
5.1	Complex method	Greater than 5 non-touch aseptic manipulations		**1**
5.2	Complex method	Syringe-to-syringe transfer		**1**
5.3	Complex method	Use of a burette admin set		**1**
5.4	Complex method	Any other "open system" manipulations such as use of ampoules (higher risk of microbial contamination than vials)		**1**
5.5	Complex method	*Mandatory* removal of fluid from infusion container		**1**
5.6	Complex method	Preparation does not follow SmPC exactly e.g. use of an alternative diluent or method		**5**
5.7	Complex method	Multiple preparations needed to administer a single "dose" because the shelf-life of the infusion is shorter than 24 hours, or less than the expected duration of infusion		**1**
6	Reconstitution of powder in a vial	Where a dry powder must be reconstituted with a liquid solvent		**1**
7.1	Use of a part vial or ampoule, or use of more than one vial or ampoule	Part vial/ampoule		**1**
7.2	Use of a part vial or ampoule, or use of more than one vial or ampoule	2-4 vials/ampoules		**2**
7.3	Use of a part vial or ampoule, or use of more than one vial or ampoule	5-10 vials/ampoules		**4**

Risk Assessment Tool: Preparation of Injectable Medicines

*****Before using the tool users please read the supporting information**
Assessing risks when reconstituting injectable medicines (SPS page)***

7.4	Use of a part vial or ampoule, or use of more than one vial or ampoule	11-20 vials/ampoules		**5**
8	Use of an infusion pump	Tick all that apply	**N/A**	**N/A**
8.1	Use of an infusion pump	All infusion pumps require some element of calculation and therefore have potential for error and should be included in the risk factors. However this potential risk is considered less significant than the risks associated with not using a pump when indicated.		**1**
8.2	Use of an infusion pump	Use of an elastomeric infusion device at near-body temperature		**2**
9	Use of any administration set or other device with which staff may not be familiar	Examples include: empty infusion bag, light protected, low adsorption, non-PVC administration set, set with non-standard in-line filter or air inlet		**1**

Add all risk scores together and determine total risk rating

Total risk score	

Risk Score less than 6	Low Risk: Proposed method/ arrangements have controlled the risks to acceptable levels and preparation can proceed as assessed once assigned actions are complete.
Risk Score 6 to 8	Medium Risk: Proposed method/arrangements control some risks, but residual risks remain. Preparation may proceed as assessed after introduction of assigned actions. Additional mitigation should be considered where possible to further reduce these risks. Where the risk points come from multiple starting containers (i.e. vials), these cannot be mitigated in a clinical area, and preparation in pharmacy is recommended.
Risk Score greater than 8	High Risk: Despite proposed method/arrangements, the risk remains high. To proceed with preparation the organisation must fully understand and accept the risks and must ensure that all proposed mitigations are implemented. It may not be possible to adequately mitigate the identified risks of preparation in a clinical area, for a cytotoxic for example. In this case the medicine should be prepared only in a pharmacy aseptic unit. If preparation in a pharmacy aseptic unit is impossible, residual risks should be documented and must be formally accepted by the local organisational governance process. The need for an entry in the organisation's risk register should be considered. Regular review of the process is required to identify further risk reduction opportunities. Where the risk points come from multiple starting containers, use of elastomeric device at near body temperature and/or doesn't exactly follow the SmPC, these risks cannot be mitigated in a clinical area, and preparation in pharmacy is recommended.

Assessing risks when reconstituting injectable medicines

Worked Example: Teplizumab

What?

Immunotherapy and anti-CD3 monoclonal antibody approved to slow down or delay the onset of clinical (stage 3) type 1 diabetes

How?

- **Immune Modulation:** It binds to CD3 receptors on T cells, disarming or modifying the specific immune cells that mistakenly attack and destroy insulin-producing beta cells in the pancreas.
- **Beta Cell Preservation:** By slowing down this immune attack, it helps the pancreas continue producing natural insulin longer.
- **Delayed Onset:** Clinical trials show it can delay the start of insulin-treated stage 1 type 1 diabetes by an average of nearly 3 year

Who?

NICE Approved for adults and children aged 8 and older who are in early-stage (stage 2) type 1 diabetes (TA1176 published 9 July 2026)

What Else?

- Daily IV infusion over a minimum of 30 minutes for **14 consecutive days**
- The dosage escalates progressively over the first five days based on body surface area (BSA)
- Presented as a concentrate.
- 3 stage calculation in SmPC
- In use stability – 4 hours
- Blood Tests required before and after dosing.
- SmPC requires the use of a PVC bag of diluent
- SmPC directs removal of a diluent from the PVC bag
- Manipulations +++

Risk Assessment

Therapeutic risk	**There is a significant inherent risk of patient harm if the injectable medicine is not prepared and/or administered as intended**

Score 1: YES or (NO)

High risk route of administration	**Examples include intra-ocular, intrathecal, intracerebral, epidural, intraosseous etc.**

Score 10: YES or (NO)

Use of a concentrate	**Where further dilution after reconstitution is essential for safe administration use, i.e. when slow iv injection of undiluted medicine is not appropriate and/or potentially harmful**

Score 3: YES or NO

Complex calculation	**Any calculation with more than one step required for preparation and/or administration**

Score 1: YES or NO

Complex method	Complex preparation method - tick all in the list below that apply	N/A	N/A
Complex method	Greater than 5 non-touch aseptic manipulations		1
Complex method	Syringe-to-syringe transfer		1
Complex method	Use of a burette admin set		1
Complex method	Any other “open system” manipulations such as use of ampoules (higher risk of microbial contamination than vials)		1
Complex method	Mandatory removal of fluid from infusion container		1
Complex method	Preparation does not follow SmPC exactly e.g. use of an alternative diluent or method		5
Complex method	Multiple preparations needed to administer a single “dose” because the shelf-life of the infusion is shorter than 24 hours, or less than the expected duration of infusion		1

Teplizumab Score:

3 to 8 depending on availability of PVC bag

Discussion point – can I enhance the tool / escalate if risk not covered?

Reconstitution of powder in a vial	**Where a dry powder must be reconstituted with a liquid solvent**		

Score 1: YES or NO

Use of a part vial or ampoule, or use of more than one vial or ampoule	**Part vial/ampoule**		1
Use of a part vial or ampoule, or use of more than one vial or ampoule	2-4 vials/ampoules		2
Use of a part vial or ampoule, or use of more than one vial or ampoule	5-10 vials/ampoules		4
Use of a part vial or ampoule, or use of more than one vial or ampoule	11-20 vials/ampoules		5

Teplizumab Score: 2 (heavier patients)

Use of an infusion pump	**All infusion pumps require some element of calculation and therefore have potential for error and should be included in the risk factors. However this potential risk is considered less significant than the risks associated with not using a pump when indicated.**		1
Use of an infusion pump	Use of an elastomeric infusion device at near-body temperature		2

Teplizumab Score: 1

Use of any administration set or other device with which staff may not be familiar	**Examples include: empty infusion bag, light protected, low adsorption, non-PVC administration set, set with non-standard in-line filter or air inlet**

Score 1: YES or NO

Specialist Pharmacy Service

NHS

Assessing risks when reconstituting injectable medicines (SPS page)***

	Risk factors	Description of individual risks	Allocated score	Score if applicable
1	Therapeutic risk	There is a significant inherent risk of patient harm if the injectable medicine is not prepared and/or administered as intended	NO	1
2	High risk route of administration	Examples include intra-ocular, intrathecal, intracerebral, epidural, intraosseous etc.	NO	10
3	Use of a concentrate	Where further dilution after reconstitution is essential for safe administration use, i.e. when slow iv injection of undiluted medicine is not appropriate and/or potentially harmful	3	3
4	Complex calculation	Any calculation with more than one step required for preparation and/or administration	1	1
5	Complex method	Complex preparation method - tick all in the list below that apply	N/A	N/A
5.1	Complex method	Greater than 5 non-touch aseptic manipulations (Draw up 2mL, Draw up 18mL, Mix, Withdraw from infusion bag OR draw up 25mL into syringe, Draw up dose volume, Add dose volume)	1	1
5.2	Complex method	Syringe-to-syringe transfer	1	1
5.3	Complex method	Use of a burette admin set	NO	1
5.4	Complex method	Any other "open system" manipulations such as use of ampoules (higher risk of microbial contamination than vials)	NO	1
5.5	Complex method	*Mandatory* removal of fluid from infusion container	1	1
5.6	Complex method	Preparation does not follow SmPC exactly e.g. use of an alternative diluent or method	TBC - dependent on availability of PVC bags	5
5.7	Complex method	Multiple preparations needed to administer a single "dose" because the shelf-life of the infusion is shorter than 24 hours, or less than the expected duration of infusion	NO	1
6	Reconstitution of powder in a vial	Where a dry powder must be reconstituted with a liquid solvent	NO	1
7.1	Use of a part vial or ampoule, or use of more than one vial or ampoule	Part vial/ampoule	1 May require 2 vials for larger patients	See above	1 2
7.2	Use of a part vial or ampoule, or use of more than one vial or ampoule	2-4 vials/ampoules	See above	2
7.3	Use of a part vial or ampoule, or use of more than one vial or ampoule	5-10 vials/ampoules	NO	4
7.4	Use of a part vial or ampoule, or use of more than one vial or ampoule	11-20 vials/ampoules	NO	5
8	Use of an infusion pump	Tick all that apply	N/A	N/A
8.1	Use of an infusion pump	All infusion pumps require some element of calculation and therefore have potential for error and should be included in the risk factors. However this potential risk is considered less significant than the risks associated with not using a pump when indicated.	1	1
8.2	Use of an infusion pump	Use of an elastomeric infusion device at near-body temperature	NO	2
9	Use of any administration set or other device with which staff may not be familiar	Examples include: empty infusion bag, light protected, low adsorption, non-PVC administration set, set with non-standard in-line filter or air inlet	NO	1

Total risk score	9

Risk Score greater than 8	High Risk:, the preparation risk remains high. To proceed with preparation the organisation must fully understand and accept the risks and must ensure that all proposed mitigations are implemented. It may not be possible to adequately mitigate the identified risks of preparation in a clinical area, for a cytotoxic for example. In this case the medicine should be prepared only in a pharmacy aseptic unit. If preparation in a pharmacy aseptic unit is impossible, residual risks should be documented and must be formally accepted by the local organisational governance process. The need for an entry in the organisation's risk register should be considered. Regular review of the process is required to identify further risk reduction opportunities..	X

Risk Mitigation

Supply Ready to Administer i.e. make in aseptics

Not possible to outsource due to short in-use shelf life?

Not possible to make in aseptics as no 7-day service?

Make in Clinical Area?

Mitigate with prescriptive clinical area worksheet?
Competency Training for nurses?

Ensure SmPC Can be utilised

Ongoing dialogue with regulator – SmPC is likely to change.

There is no perfect solution for many organisations…..highlight risk through organisational governance processes and get acceptance of proposed mitigations.

Guidance from SPS

Assessing risks when reconstituting injectable medicines

Use of injectable medicines for multiple doses

Assessing risks when reconstituting injectable medicines

Supports:

Structured risk assessment

Decision making

Consistent documentation

Use of injectable medicines for multiple doses

Supports:

Assessing product suitability

Safe multiple-dose use

Governance considerations

Supporting tools

MSOs can use:

Templates

Assessment tools

Governance frameworks

Organisational leadership approaches

Is SPS Guidance Enough?

Expect explicit Professional Standards for all organisations (regardless of whether they have an aseptic unit).

Clear governance expectations to enhance decision making and optimise use of limited aseptic capacity (where available).

Key messages

- Safe use of injectable medicines is a system-wide governance issue
- It requires collaboration and effective communication
- Interfaces are critical - clinical-to-technical bridging required.
- SPS have provided practical tools and resources – adapt them for use in your organisation – make them work for you
- Further collaboration between MSOs, Medusa teams, MHRA, local safety and governance teams and SPS will contribute to increasing patient safety
- Watch this space for future guidance