Provincial Clinical Knowledge Topic

TBu, Adult BMT– Inpatient

V 1.0

Revision History

Version	Date of Revision	Description of Revision	Revised By
1.0	January 29, 2019	Topic Completed	See Acknowledgments

Important Information Before you Begin

The recommendations contained in this knowledge topic have been provincially adjudicated and are based on best practice and available evidence. Clinicians applying these recommendations should, in consultation with the patient, use independent medical judgment in the context of individual clinical circumstances to direct care. This knowledge topic will be reviewed periodically and updated as best practice evidence and practice change.

The information in this topic strives to adhere to Institute for Safe Medication Practices (ISMP) safety standards and align with Quality and Safety initiatives and accreditation requirements such as the Required Organizational Practices. Some examples of these initiatives or groups are: Health Quality Council Alberta (HQCA), Choosing Wisely campaign, Safer Healthcare Now campaign etc.

Guidelines

This topic is based on the following guideline(s): Alberta Blood and Marrow Transplant Program (ABMTP) Standard Practice Manual

Please refer to ABMTP Standard Practice Manual for more information and recommendations about this topic.

Keywords

Topic Name: TBu, Adult BMT - Inpatient

- Alberta Blood and Marrow Transplant Program (ABMTP)
- Blood and Marrow Transplant (BMT)
- Stem Cell Transplant
- Autologous Transplant
- Conditioning

Guides:

- Order set should include access to the ABMTP Standard Practice Manual

References:

- Reference in Order Groups as indicated in each protocol once developed
  - Stem Infusion: Autologous
- If acetaminophen, metoclopramide, metronidazole, or prochlorperazine are ordered, alert ordering clinician these medications are not recommended starting 3 days (Day -11) prior to Day -8 busulfan and continuing until after last busulfan infusion is complete on Day -2 (Can be removed if attached to drug order)

TBu, Adult BMT Inpatient Order Set

Order Set Keywords: bone marrow transplant, blood and marrow transplant, BMT, thiotepa, busulfan, autologous transplant, conditioning, primary CNS Lymphoma, transplant eligible, step 4

Order Set Requirements

Most recent:

- Height _____ cm
- Weight
  - actual _____ kg
  - ideal _____ kg
- BSA _____ m^2
- Estimated Creatinine Clearance (CrCl) _____
- Bilirubin and creatinine lab results

Link patient weight with recommended dose of filgrastim

- For patient weighing less than 60 kg: filgrastim 300 mcg IV/SUBCUT daily
- For patient weighing 60 – 90 kg: filgrastim 480 mcg IV/SUBCUT daily
- For patient weighing more than 90 kg: filgrastim 600 mcg IV/SUBCUT daily

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Indication

Autologous Conditioning for Primary CNS Lymphoma Transplant Eligible - Step 4

Treatment Cycle and Dates

Stem Cell Infusion date: Day 0 _____ (*dd-Mon-yyyy*)

Protocol Summary:

Protocol DAY -6 and -5

thiotepa 300 mg/m^2 (ideal)/dose

Protocol DAY -4, -3, -2

busulfan 3.2 mg/kg/dose (Target AUC not to exceed 4500 umol x min/L)

Protocol DAY 0

Autologous Stem Cell Infusion

~Start of Order Panel~ BMT Laboratory Investigation – ONCE - Inpatient

**BMT Laboratory Investigation – ONCE - Inpatient

Keywords: Admission, labs, one time
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ONCE – Day of Admission/Pre-Treatment - STAT

☐ Unit to Collect ☐ Lab to Collect

Hematology

☑ Complete Blood Count (CBC) with Differential
☑ PTT
☑ PT (INR)
☐ Retic count

Chemistry

☑ Electrolytes (Na, K, Cl, CO2)
☑ Creatinine
☑ Glucose Random
☑ Calcium (Ca)
☑ Magnesium (Mg)
☑ Phosphate
☑ Albumin
☑ ALP
☑ ALT
☑ Bilirubin Total
☑ Bilirubin Direct
☑ GGT
☐ LD
☑ Protein Total
☑ Urea
☑ Urate (uric acid)

Other Labs

Order for ALL women of childbearing age

☐ HCG Beta - serum

Urine Tests

☐ Urinalysis

~End~

~Start of Order Panel~ BMT Laboratory Investigation – REPEATING - Inpatient

**BMT Laboratory Investigation – REPEATING - Inpatient

Keywords: labs, repeat, Day 2

REPEATING - Starting on second day of protocol

☐ Unit to Collect ☐ Lab to Collect

Draw the following labs daily for 35 occurrences:

☑ Complete Blood Count (CBC) with Differential
☑ Electrolytes (Na, K, Cl, CO2)
☑ Creatinine
☑ Magnesium (Mg)

Draw the following labs every Mon/Thurs for 5 weeks:

Hematology

☑ PTT
☑ PT (INR)
☑ Retic Count

Chemistry

☑ Glucose Random
☑ Calcium (Ca)
☑ Phosphate
☑ Albumin
☑ ALP
☑ ALT
☑ Bilirubin Total
☑ Bilirubin Direct
☐ GGT
☐ LD
☐ Protein Total
☑ Urea
☐ Urate (uric acid)

~End~

Choose both Day -4 and Day -2, only ONE, or no levels to be drawn:

Day -4

~Start of Smart Group~ Busulfan Pharmacokinetic (PK) Testing - Inpatient

*Busulfan Pharmacokinetic (PK) Testing - Inpatient

☐ **Busulfan PK Levels:** Draw first sample within 5 minutes after completion of sodium chloride 0.9% 25 mL IV flush and then at 1, 3, 5, and 7 hour intervals post busulfan infusion: Level must be drawn from a non-Busulfan infusion lumen of central venous access device (CVAD)

- Busulfan – End of Infusion LEVEL**:** Label sample with time. Place on ice and send to lab
- Busulfan – 1 Hour LEVEL**:** Label sample with time. Place on ice and send to lab
- Busulfan – 3 Hour LEVEL**:** Label sample with time. Place on ice and send to lab
- Busulfan – 5 Hour LEVEL**:** Label sample with time. Place on ice and send to lab
- Busulfan – 7 Hour LEVEL**:** Label sample with time. Place on ice and send to lab

~End~

Day -2

~Start of Smart Group~ Busulfan Pharmacokinetic (PK) Testing - Inpatient

*Busulfan Pharmacokinetic (PK) Testing - Inpatient

☐ **Busulfan PK Levels:** Draw first sample within 5 minutes after completion of sodium chloride 0.9% 25 mL IV flush and then at 1, 3, 5, and 7 hour intervals post busulfan infusion: Level must be drawn from a non-Busulfan infusion lumen of central venous access device (CVAD)

- Busulfan – End of Infusion LEVEL**:** Label sample with time. Place on ice and send to lab
- Busulfan – 1 Hour LEVEL**:** Label sample with time. Place on ice and send to lab
- Busulfan – 3 Hour LEVEL**:** Label sample with time. Place on ice and send to lab
- Busulfan – 5 Hour LEVEL**:** Label sample with time. Place on ice and send to lab
- Busulfan – 7 Hour LEVEL**:** Label sample with time. Place on ice and send to lab

~End~

☐ **No Busulfan Pharmacokinetic Testing to be drawn**

Day -6 to Day -3

~Start of Smart Group~ Thiotepa Skin Care Protocol - Inpatient

* Thiotepa Skin Care Protocol – Inpatient

Starting first day of thiotepa and continuing until 36 hours post last dose of thiotepa

Patient Teaching

☐ Teach - Patient Education - Thiotepa Skin Care: The protocol is in effect from the start of the thiotepa infusions until 36 hours post last dose of thiotepa. Thiotepa is excreted mostly through the urine (85%) but a percentage is excreted through the sweat glands. As a result, this can cause significant toxicity to the skin if not cared for properly, therefore, strict adherence to the protocol is necessary

Activity

☐ Mobilize - Encourage patient to mobilize or ambulate each day. An occlusive-like phenomena occurs with the bed or chair during prolonged sitting, predisposing the patient to increased dermal toxicity

Patient Care

- ☐ Foley Catheter - Action: Insert prior to thiotepa administration if patient unable to adequately perform perineal care
- ☐ Foley Catheter – Remove: 96 hours after insertion
- ☐ Neurological Vital Signs - every 4 hours: In brain tumor patients who have received CNS irradiation; Re-orient patient and maintain safety precautions if any CNS symptoms exist, and report new onset of symptoms to provider

Hygiene and Grooming

- ☐ Hygiene and Grooming - Shower every 6 hours; Do NOT apply CVC barrier dressing or allow water to spray directly on CVC site during shower
- ☐ Hygiene and Grooming - Change all bed linens with every shower
- ☐ Hygiene and Grooming - Perineal Care: Use peri-bottle filled with tap water every 3 hours and post each void (if no foley) and bowel movement
- ☐ Hygiene and Grooming - Patient not to use: soap, occlusive creams, ointments, deodorants, or any other skin care agents
- ☐ Clothing/Dressing - No restrictive clothing, jewellery, or head coverings, including wigs

Skin – Assess and Care

- ☐ Assess - all areas of body; every shift and PRN: Assess for skin breakdown, especially the groin, gluteal folds, perineum, axilla, and under breast area. **Continue until 3 weeks post start of thiotepa administration** as skin breakdown may take 10 to 14 days to manifest
- ☐ Skin Care - No tapes or adhesives should be applied to; Use gauze dressing secured with non-adhesive material (i.e. kling, self-adhesive wrap) where necessary
- ☐ Assess Wound - Hands; daily; Ensure the areas where thick scabs have developed on hands have new healthy, pink, intact skin underneath scabs; If unable to assess and/or debridement is required, enter ET Nurse referral
- ☐ Wound Care - Areas of skin breakdown: Cleanse with sterile water; every shift and PRN; Use sterile water only; Use of a 60 mL syringe may facilitate cleaning of folds or sensitive areas. Keep area as clean and dry as possible
- ☐ ET Nurse – Enter ET Nurse referral if extensive wound care and debridement is required

Central Venous Access Device (CVAD) Care

- ☐ CVAD Site Care: Cleanse site with normal saline only; perform daily and/or post showers to ensure water residue is removed from the site and line
- ☐ CVAD Site Care: Gauze and Disc dressing if available or leave site open to air; No tapes or adhesives should be applied; Ensure CVAD is properly secured where necessary

~End~

Provider Communication

- ☐ Provider Communication: busulfan test dose not required for this protocol
- ☐ Provider Communication: busulfan treatment dose levels only ordered at sites where pharmacokinetics are measured; May eliminate one or both days of PK levels if appropriate
- ☐ Provider Communication: busulfan exposure should be kept below an AUC of 4500 umol x min/L

Nurse Communication

☐ Nurse Communication: Initiate mouth care protocol
☐ Nurse Communication: Irradiated Blood Products only
☐ Nurse Communication: Ensure central venous access device is insitu and patent prior to initiating treatment protocol
☐ Nurse Communication: Ensure *Thiotepa Skin Care Protocol – Inpatient* is initiated
☐ Nurse Communication - Do Not Order/ Do Not Give: Avoid use of acetaminophen, metoclopramide, metronidazole, prochlorperazine or other medications that may lower seizure threshold or interfere with busulfan clearance starting 3 days (Day -7) prior busulfan on Day -4 and continuing until after last busulfan infusion is complete

Pre-Medication

☐ ondansetron 8 mg IV/PO TID starting on Day -6 for a total of 8 days; Give morning dose 30 to 60 minutes pre-chemotherapy

Busulfan Seizure Prophylaxis

☐ LORazepam 1mg SUBLING tab QID starting Day -4 for a total of 4 days; Continue until 24 hours post final busulfan infusion

Intravenous Fluids

Day -7, -6, -5, -4

☐ 0.9% NaCl IV at 100 mL/hour starting on Days -7 and continuing until Day -4 post busulfan infusion **OR** post busulfan LEVEL draws

Day -3, -2

☐ 0.9% NaCl IV at 100 mL/hour once on Days -3, -2; Infuse concurrently with busulfan and continue until busulfan infusion complete each day, **OR** until busulfan LEVEL draws are complete

Systemic Therapy

If actual body weight is less than ideal body weight, use actual body weight for all dosing calculations

☐ thiotepa (300 mg/m^2-ideal) _____ mg IV daily on Day -6 and -5 for a total of 2 doses; Infuse each dose over 3 hours; Requires 0.2 to 0.22 micron filter on primary line
  ❖ *Dosing adjustments: Dosage reduction may be required for renal and hepatic impairment*

If ideal body weight is less than actual body weight, use ideal body weight for all dosing calculations.
Seizure prophylaxis required with BMT doses

☐ busulfan (3.2 mg/kg) _____mg IV daily on Day -4, -3, -2 for a total of 3 doses. **Infuse at a rate of 160 mL/hr;** Requires 0.2 to 1.2 micron filter on primary line; busulfan exposure should be kept below an AUC of 4500 umol x min/L; busulfan test dose not required for this protocol
  ❖ *Dosing adjustments: Dosage adjustment may be required as a result of pharmacokinetic analysis*

Day 0

Required order set *(Currently under development; to be referenced in upon completion)*

- **Stem Cell Infusion – Autologous**

~Start of Smart Group~ Filgrastim

*Filgrastim

For patient weighing less than 60 kg

☐ filgrastim 300 mcg SUBCUTANEOUS daily starting on Day 7; Discontinue when absolute neutrophil count (ANC) greater or equal to $1x10^9$/L for 24 hours; May be given intravenously

OR

For patient weighing 60 to 90 kg

☐ filgrastim 480 mcg SUBCUTANEOUS daily starting on Day 7; Discontinue when absolute neutrophil count (ANC) greater or equal to $1x10^9$/L for 24 hours; May be given intravenously

OR

For patient weighing greater than 90 kg

☐ filgrastim 600 mcg SUBCUTANEOUS daily starting on Day 7; Discontinue when absolute neutrophil count (ANC) greater or equal to $1x10^9$/L for 24 hours; May be given intravenously

~End~

~Start of Order Panel~ BMT Electrolyte Imbalance - Inpatient

** BMT Electrolyte Imbalance - Inpatient

Order Set Keywords: potassium, K, KCl, magnesium, Mg

Nurse Communication:

☐ Nurse Communication: Ensure patient has no other IV potassium infusing while receiving PRN IV potassium doses

Potassium:

*Choose **ONE** option based on site availability of product*

☐ KCl 20 mmol in 100 mL sterile water IV bolus daily PRN if potassium level 3.0 to 3.3 mmol/L; infuse as per provincial parenteral monograph

OR

☐ KCl 10 mmol in 100 mL sterile water IV bolus daily PRN; Give 2 boluses for a total of 20 mmol if potassium level 3.0 to 3.3 mmol/L; Infuse as per provincial parenteral monograph

Magnesium:

☐ magnesium sulfate 4 grams IV daily PRN if magnesium level is LESS than 0.55 mmol/L; Infuse as per provincial parenteral monograph

~End~

~*Start of Smart Group*~ *Autologous Prophylactic/Supportive Medication - Inpatient*

*Autologous Prophylactic/Supportive Medication – Inpatient

Prophylactic Medications

☐ valACYclovir 500 mg PO daily starting on day of admission

Start Protocol Day 14 if neutrophils are greater than $1x10^9/L$

☐ sulfamethoxazole - trimethoprim 400 mg - 80 mg 1 tab PO daily starting on Day 14 if neutrophils are greater than $1x10^9/L$

OR

If patient has allergy to sulfa or sulfamethoxazole/trimethoprim order one or both:

Start Protocol Day 14 if neutrophils are greater than $1x10^9/L$

☐ dapsone 50 mg PO daily starting on Day 14 if neutrophils are greater than $1x10^9/L$

☐ penicillin V potassium 300 mg PO BID starting on Day 14 if neutrophils are greater than $1x10^9/L$

Supportive Medications

Only order for menstruating women

☐ norethindrone - ethinyl estradiol (Ortho 1/35®) 1 tab PO daily starting on day of admission

~*End*~

Transition Planning

Patient and Family Education

MyHealth.Alberta.ca

- Cancer Resources
- Autologous Stem Cell Transplant

YouTube: AHS Channel

- CancerControl Alberta Playlist

Transitions to Primary Care

Alberta Health Services Website (External)

- Provider and Patient Resources

Patient Medication Teaching Sheets

MyHealth.Alberta.ca

- Busulfan
- Ondansetron
- Lorazepam
- Dapsone
- Sulfamethoxazole/Trimethoprim
- Penicillin V Potassium
- Fluconazole
- Valacyclovir
- Ursodiol
- Norethindrone/ethinyl estradiol

Lexicomp Website (Internal)

- Thiotepa - Please see *Adult Patient Education: Thiotepa* on the Lexicomp website

References

1. Cancer Control Alberta: Guideline Resource Unit: Alberta Blood and Marrow Transplant Program (ABMTP) Standard Practice Manual. Alberta, Canada. https://www.albertahealthservices.ca/assets/info/hp/cancer/if-hp-cancer-guide-bmt-manual.pdf. Updated January 16, 2017. Accessed July 1, 2018.

Acknowledgements

We would like to acknowledge the contributions of the clinicians who participated in the development of this topic. Your expertise and time spent are appreciated.

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Your time spent reviewing the knowledge topics and providing valuable feedback is appreciated.

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