\*The intent of this product is to be a resource; not a replacement for institutional protocols. Standard 1 of AmSECT’s Standards and Guidelines for Perfusion Practice.1 These Standards and Guidelines may also be superseded by the judgement of the healthcare professional taking into account the facts and circumstances of the individual case.

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| **SUBJECT/TITLE** | **Bleomycin Toxicity** | |
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| **PURPOSE:** | To provide a guideline and resource for Bleomycin Toxicity andthe methods for prevention. | |
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| **TARGET POPULATION:** | Patients that have had prior exposure to Bleomycin. | |
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| **DEFINITIONS:** | Bleomycin is a platinum-based chemotherapeutic drug that can  cause cardiovascular toxicity. Bleomycin in conjunction with  other drugs is typically used to treat testicular, ovarian, and  other solid cancers.  The drug can cause lung sensitivity to typically harmless higher  FiO2 levels, such as experienced while under anesthesia or on  bypass. The drug reacts with oxygen to produce hydroxide free  radicals that cleave DNA.  As Bleomycin is broken down, the capillary endothelium  separates from the basement membrane causing increased  permeability and edema. The increased permeability allows  Bleomycin to enter the cells causing cell membrane destruction  and necrosis leading to pulmonary fibrosis.(1)  Acute pulmonary toxicity and pulmonary embolisms are side  effects for Bleomycin patients.(2) | |
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**POLICY:**

1. The length of time since the last dose and total dose of Bleomycin administered, play a role in the absence or severity of an oxygen toxicity reaction. (3)
2. A drastically lower than routine FIO2 may be needed for the case.
3. Hemodilution, hypercapnia and normothermia should also be considered.

**PERFUSION PUMP CONSIDERATIONS:**

1. The surgeon will determine the low limit threshold of PO2 and SaO2. Then manage the lowest FiO2 possible to stay within those determined parameters.
   1. Variation exists among articles as to the exact safe FiO2. Wuethrich determined that 30% FiO2 did not cause lung toxicity while Allen’s patients at an FiO2 of 45% *did* experience toxicity effects.(4)(5)
   2. While in the OR, the effects of toxicity or decreased patient parameters may not appear immediately and can manifest later. Therefore, do not mistake seemingly normal ventilation and blood gases for a lack of Bleomycin interaction with a higher than needed FiO2.
   3. The surgeon should dictate the expected length of case and any hypothermia conditions which may make oxygenation more difficult.
2. Consider using colloids instead of crystalloids to avoid increased lung edema.(5)
3. Renal insufficiency may decrease Bleomycin clearance if the last dose has been recently administered (24-48hrs), for this reason elective cases should be postponed if possible.(1)
4. Consider hypercapnia which can reduce pulmonary dilation and may decrease pulmonary exposure to excess FiO2 during the procedure.
5. Administration of corticosteroids may aid in pulmonary recovery.(6)

**PROCEDURE:**

1. Maintain lowest FiO2 possible to stay within determined PO2/SaO2
   1. High (>40%) FiO2 concentrations should be avoided
2. Use Colloids where appropriate in lieu of crystalloids to decrease edema.(5)
3. Maintain higher pCO2 levels on bypass, which may decrease pulmonary exposure to excess FiO2 during the procedure.

**CLINICAL ASSESSMENT/SCREENING:**

1. Contraindications: None

# RELATED DOCUMENTS:

1. n/a

# REFERENCES:

1. Mathes D. Bleomycin and Hyperoxia Exposure in the Operating Room. Anesth Analg. 1995; 81: 624-9.
2. Lauritsen J, Kier M, Bandak M, Mortensen M, Thomsen F, Mortensen J et al. Pulmonary Function in Patients with Germ Cell Cancer Treated with Bleomycin, Etoposide, and Cisplatin. J Clinical Onocology. 2016; 34: 1492-9.
3. Real E, Roca M, Vinuales A, Pastor E, Grau E. Life Threatening Lung Toxicity Induced my Low Doses of Bleomycin in a Patient with Hodgkin’s Disease. Haematologica. 1999; 84(7): 667-8.
4. Wuethrich P, Burkhard F. No Perioperative Pulmonary Complications after Restricted Oxygen Exposition in Bleomycin-Treated Patients: A Short Report. ISRN Anesthesiology. 2011; 1-3.
5. Allen S, Riddell G, Butchart E. Bleomycin therapy and Anesthesia. Anesthesia. 1981; 36: 60-3.
6. Ingrassia T, Ryu J, Trastek V, Rosenow E. Oxygen-Exacerbated Bleomycin. Mayo Clinic Proc. 1991; 66:173-8.

# DISCLAIMER:

In emergency situations, immediate life support measures of whatever appropriate nature come first with attention turning to measures described in this protocol/process as soon as possible and practical.

This is a minimal protocol/process that may be exceeded at any time based on the judgment of the involved patient care personnel.

This protocol/process encourages high quality patient care but observing it cannot guarantee any specific patient outcome.

This protocol/process is subject to revision from time to time, as warranted by the evolution of technology and practice.

Review period: Review as changes occur or per institutional protocol.

Original hard copies and computer copies of this protocol are stored under the supervision of the Chief Perfusionist, Department of Cardiovascular Perfusion.

Documents relating to patient care standards are developed according to the accepted hospital standards.

# APPROVED BY: *(signature of CMO and CNE only required)*

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