

PREPARING STAFF FOR BONE CEMENT IMPLANTATION SYNDROME

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CLINICAL SIGNIFICANCE

Bone Cement Implantation Syndrome (BCIS) is a rare but potentially life-threatening complication associated with orthopedic procedures using polymethylmethacrylate (PMMA) cement. Early clinical manifestations - such as sudden hypoxia, hypotension, arrhythmias, or cardiovascular collapse - can occur within seconds of cementation. Perioperative nurses are uniquely positioned to detect the earliest warning signs and activate a rapid, coordinated team response, making BCIS recognition a high-impact patient safety priority.

BACKGROUND

BCIS occurs when embolic material, vasodilation, or mediator release triggers cardiovascular instability during cemented arthroplasty. Literature reports incidence rates of mild BCIS as high as 28%, with severe cases leading to significant morbidity and mortality. A retrospective review at our facility revealed inconsistent recognition and documentation of early BCIS indicators. A standardized education and communication process was developed to improve intraoperative awareness and response.

OBJECTIVES

- Increase perioperative staff knowledge and recognition of BCIS symptoms.
- Improve intraoperative communication during cementation.
- Standardize a BCIS early-warning response to support rapid intervention.
- Strengthen interdisciplinary teamwork between anesthesia, circulating nurse, and surgeon during high-risk phases.

PLANNING AND PREPARATION

Team: Circulating nurses, anesthesia providers, orthopedic surgeons, clinical educator, and quality/safety representative.

Education: 30-minute in-service for OR staff. laminated "BCIS Quick Recognitin Cards" placed on anesthesia machines, simulation scenario focused on early symptom detection and communication, and Introduction of a "Cement Time-Out" to announce high-risk moments.

PATIENT POPULATION

Patients at higher risk of developing BCIS:

- Elderly (especially >75 years)
- Osteoporotic bone
- Cardiopulmonary comorbidities (CHF, COPD)
- Hypovolemia or poor preoperative fluid status
- Pathological fractures or bone tumors
- Revision surgeries
- Long stem arthroplasty

SIGNS AND SYMPTOMS

Observed During Surgery:

- Sudden hypoxia (\downarrow SpO₂)
- Hypotension (\downarrow BP)
- Increased airway pressure
- Cardiac arrhythmias
- Loss of consciousness (if under regional anesthesia)
- Cardiac arrest

ROLES IN ROOM

CIRCULATORS

- ENSURE PRE-OP RISK FACTORS ARE DOCUMENTED AND COMMUNICATED
- CONFIRM EQUIPMENT READINESS (RESUSCITATION CART, O₂, SUCTION)
- MONITOR HEMODYNAMICS AND COORDINATE WITH ANESTHESIA
- COMMUNICATE PROCEDURE STAGES CLEARLY (E.G., "CEMENTING NOW")
- STAY ALERT FOR SUDDEN CHANGES IN VITALS

SCRUBS

- ANTICIPATE AND PREPARE CEMENT EFFICIENTLY
- COMMUNICATE WHEN CEMENT MIXING AND PROSTHESIS PLACEMENT BEGINS
- BE PREPARED FOR RAPID PROGRESSION OF SURGICAL STEPS
- MINIMIZE DISTRACTIONS IN THE OR DURING CRITICAL PHASES

ANESTHESIA

- OPTIMIZE PRE-OP HEMODYNAMIC STATUS
- MAINTAIN ADEQUATE OXYGENATION AND VOLUME STATUS
 - ETCO₂ AND SPO₂
 - ARTERIAL PRESSURE
 - CENTRAL VENOUS PRESSURE
- PREPARE FOR RAPID INTERVENTIONS

- CONSIDER AVOIDING CEMENT IN HIGH-RISK PATIENTS
- USE PULSE LAVAGE BEFORE CEMENTING
- OBTAIN HEMOSTASIS BEFORE CEMENTING
- USE PRESSURIZER

"EARLY RECOGNITION AND INTERVENTION SAVES LIVES"

OUTCOMES AND IMPLICATIONS FOR NURSING

THIS INITIATIVE HIGHLIGHTS THE ESSENTIAL ROLE PERIOPERATIVE NURSES PLAY IN SAFEGUARDING PATIENTS DURING CEMENTED ORTHOPEDIC PROCEDURES. BY IMPROVING BCIS KNOWLEDGE AND RESPONSE READINESS, NURSES ARE BETTER PREPARED TO RECOGNIZE EARLY WARNING SIGNS, COMMUNICATE CONCERNS PROMPTLY, AND COLLABORATE WITH ANESTHESIA AND SURGICAL COLLEAGUES TO MITIGATE RISK. THE OBSERVED IMPROVEMENT IN STAFF PREPAREDNESS UNDERSCORES THE VALUE OF CONTINUED BCIS EDUCATION AS PART OF OR COMPETENCY DEVELOPMENT. STRENGTHENING BCIS RECOGNITION SKILLS AMONG OR NURSES HAS CLEAR IMPLICATIONS FOR ENHANCING PATIENT OUTCOMES, SUPPORTING RAPID INTERVENTION, AND REINFORCING NURSING'S VITAL CONTRIBUTION TO INTRAOPERATIVE SAFETY.

NOW WHAT?

CONSIDER ECMO?

CIRCULATORS

- page overhead "anesthesia board runner stat to OR X"
- bring crash cart into room
- assume code team role
 - recorder
 - crash cart
 - compressions
- order ICU bed
- remind surgeons to find family

SCRUBS

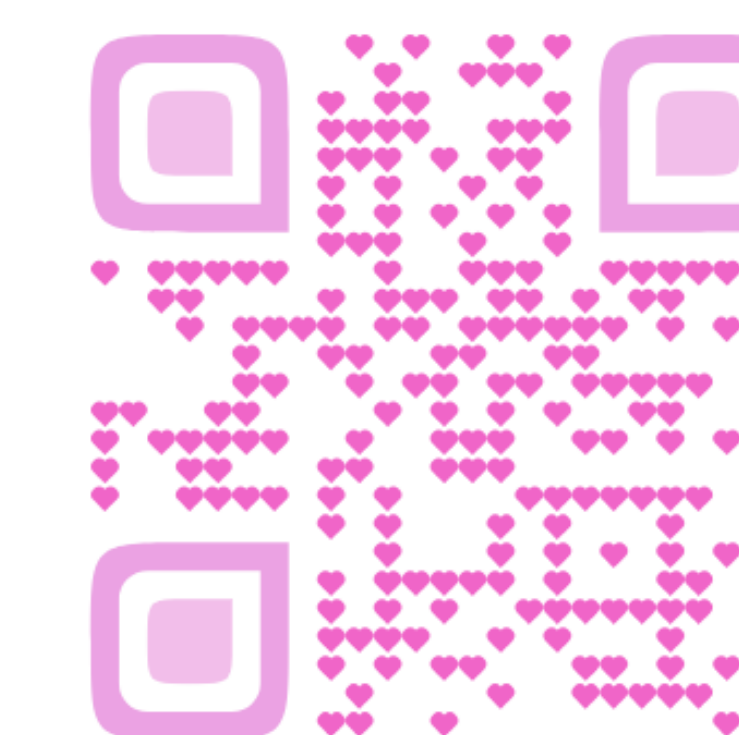
- assist surgical team with rapid closure: stapler, ioban
- keep field sterile
- assist with compressions

ANESTHESIA

- IV fluids to maintain preload to the heart
- vasopressors:
 - norpinephrine
 - epinephrine
- inotropes (dobutamine)
- TEE to confirm emboli
- Swan-Ganz to monitor FAP not standard of practice anymore

FOLLOW ACLS PROTOCOL

REFERENCES



Parkland
Nursing

