Human Patient Simulation

I. **Title: Simulation for Managing Hemorrhage as a Complication of Uterine Aspiration**

II. **Target Audience:** Residents and physicians (family medicine, obstetrics), advanced practice clinicians, women's health clinics

III. **Learning Objectives**

A. Primary Learning Objectives

- Review indications, safety and risks of uterine aspiration
- Practice mnemonic for hemorrhage to review causes (4T's: Tissue, Tone, Trauma, Thrombin)[1] and management (2 T's: Treatment, Transfer) with action items for each
- Learn and practice skills of "cannula test" and assessing cervical bleeding used in management of post-aspiration hemorrhage
- Learn and practice uterine tamponade with foley catheter or bakri balloon used in management of post-aspiration hemorrhage

B. Secondary Learning Objectives

- Review manual vacuum aspiration and equipment
- Review risk factors for post-aspiration hemorrhage
- Recognize significant ultrasound findings in hemorrhage

C. Critical Actions Checklist

- Simple checklist of critical actions
  - Trainees should be able to correctly identify and perform 75% of "6T" mnemonic with 2 action items for each "T"
- Optimal sequence of critical actions
  - There are no point advantages or penalties for listing steps in a particular order (except for Tissue as most common of "4T" etiologies in post-aspiration bleeding)
- Duration to critical actions
  - Trainees may have approximately 10 minutes each to run through case simulation drill and steps.
- Criterion standards of performance by level of learner
  - Pre-and post-test knowledge points and self-assessed competence are used to assess improvement.
  - A passing level for all trainees should be 75% of the "6T" mnemonic and naming or performing 2 action items for each "T"

IV. Environment

1) The Classroom Simulation Lab helps facilitate individual learner problem-solving and hands-on skills acquisition. The instructor uses the PowerPoint slides to review indications, safety and risks for uterine aspiration. Then instructor presents Case 1, leading group through a fishbowl case demonstration, and allowing participants to brainstorm the causes of hemorrhage in the setting of uterine aspiration, and possible management steps for each cause. Additional slides review these again with the "6 T" mnemonic. Then the class splits into groups of 2-3 to run through the case, practicing the management steps and skills.

2) The Clinic Simulation Exercise can be run with the entire clinic team to facilitate emergency preparedness, role delegation, closed-loop communications, and stress readiness.

A. Lab Set Up

1. Classroom: Lab can use a computer and projector to show the PowerPoint slides (or alternately use handouts). Set up should assure there is adequate table space for a demonstration and trainees in groups of two to three. Equipment can be distributed beforehand for groups of two to three trainees to work together. IV tubing should be attached to the IV fluid bags, and red dye can optionally be added to the fluid. As the simulation can get messy, we recommend use of chux to facilitate easy clean up.
2. Clinic Simulation Exercise: Use an outpatient clinic during off hours to set up the Exercise with assigned roles, so members of the clinic team can practice role delineation and emergency preparedness.

B. Mannequin set-up: There are no mannequins, but there is significant precedent for fruit models being used to simulate the uterus, as they are low cost and available in many parts of the world. In this simulation, a dragon fruit (or pitaya) is used to simulate the uterus, although a papaya can alternately be used. If using groups of three, one learner practices, a second holds the dragon fruit, and the third tracks and evaluates the performance.

C. Props

1. Equipment List (n based on groups of 3; if using groups of 2, multiply by n = ½ trainees)
    1. Manual vacuum aspirators (n=⅓ trainees + 1 for demonstration)
    2. Dragon fruit (pitaya) or papaya (n=⅓ trainees + 1 for demonstration)
    3. Cannulae #9.10 (n=⅓ trainees + 1 for demonstration)
    4. Dilators (up to size 10 Denniston or 31 Pratt) (n = 1/3 trainees)
    5. Flexible uterine sound (n=1 for demonstration)
    6. Foley catheters (n=⅓ trainees + 1 for demonstration)
    7. Saline bags (0.5-1 L) and IV tubing (n=⅓ trainees)
    8. Ring forceps (n=2)
    9. Chux / paper towels/ (n=# of trainees)

2. Optional Equipment:
    1. Red food dye (n=1)

2. Poster with algorithm (to be taken down for testing portion of the lab)
3. Uterine aspiration instrument pack (n=1 for demonstration)
4. Ultrasound images of empty uterus and uterus with fluid in cul-de-sac

D. Distractors – In the Clinic Simulation Exercise, distraction can be introduced by other patients needing the provider's attention.

V. Actors

A. Roles

1. Classroom Simulation
    a. Provider (doctor or clinician): practices management steps.
    b. Assistant: holds fruit model, assists as directed by provider.
    c. Evaluator: presents clinical case, tracks progress, and evaluates performance.
2. Clinic Simulation Exercise
    a. Provider (doctor or clinician)
    b. Patient
    c. Medical assistant
    d. Nurse (RN)
    e. Clinic administrator
    f. Front desk staff
    g. Partner/family member

B. Who may play them

1. Classroom: Within the groups, each trainee rotates through the roles of the Provider, Assistant, and Evaluator. If trainee experience is varied, it may be beneficial for the trainee more experienced in uterine aspiration to play the Provider first.
2. Clinic: For improved fidelity and practice, roles should mimic actual roles in the clinic when possible.

C. Action Role

1. Classroom: Each trainee rotates through each role, as described above.
2. Clinic: Ideally the team runs through the Clinic Simulation Exercise (see separate document) and debriefs with teaching point review, and then run through the simulation a second time to put the feedback to use. This also provides ample opportunity for clinic team members to practice specific delegation of roles.
    a. Provider (doctor or clinician): Leads clinical care, delegates team responsibilities, communicates with patient, and discusses case with ER / OB physician for transfer.
    b. Patient: experiences some pain, and asks questions anxiously.
    c. Medical assistant: takes and records vitals, actions, times
    d. Nurse: assists with meds, IV placement
    e. Clinic administrator: assists calling 911 and ER photocopying medical record, communications
    f. Front desk staff: copies record
    g. Partner/family member: supports patient

VI. Case Narrative (describes what the learner will experience)

A. Scenario Background Given to Participants

1. Case 1: 29 y/o G4P3 woman, 8 weeks 5 days in your office to manage an early pregnancy loss (intrauterine fetal demise) confirmed by ultrasound. During her procedure, she has unexpected bleeding, and does not respond to management steps.
2. Case 2: 22 y/o G2P0 woman after uncomplicated uterine aspiration for a failed medication abortion. During her procedure, she has unexpected bleeding, and does not respond to management steps.
3. Case 3: 33 y/o G4P3 woman, history of 2 previous cesarean sections, 10 week EGA for abortion, retroflexed uterus

B. Scenario conditions initially:

1. Case 1: Manual vacuum aspirator (MVA) quickly fills up with blood. You empty it, recharge and it again fills with blood. You ask your assistant to prepare another MVA but it promptly fills with blood when attached to the cannula.
2. Case 2: Called from recovery to evaluate for uterine pain with hypotension. The patient is having some ongoing bleeding.
3. Case 3: Dilation mildly difficult. While inserting cannula into retroflexed uterus, you feel the cannula get hung up at one point, and then slide in easily without a stopping point. Patient feels something sharp and points to her lower abdomen.

C. Scenario branch points: In order for trainees to practice all management steps, patients in each scenario continue to have moderate bleeding in spite of interventions, and can begin to demonstrate hypotension (progressive tachycardia and hypotension).

VII. Instructors Notes

A. Tips to keep scenario flowing in lab

During the initial fishbowl demonstration, it is helpful for the instructor to prompt learners for possible causes of hemorrhage and begin to reinforce the mnemonic (6 Ts): Tissue (most common after uterine aspiration), Tone, Trauma, and Thrombin followed by possible diagnosis and management steps for each, as well as Treatment and Transfer steps.

After teams complete steps of uterine aspiration, they should be instructed to cause an intentional perforation of the dragonfruit uterine model, so that IV tubing can be attached (screwed in) to the perforation site, and opened up to simulate uterine bleeding.

B. Tips to direct actors

1. Classroom: Depending on ratio of instructors to trainees, instructors can either roam the room to supervise and assist, or can act as the evaluators. An advantage of trainee evaluators (groups of 3) is to improve their learning, while an advantage of instructor evaluators (groups of 1-2) is to contribute to a testing atmosphere and assure completeness of the simulation. Allowing trainees to generate next steps without cues or prompting will reinforce problem solving and stress readiness.
2. Clinic: To focus on clinical management, those playing the patient and support person could minimize their dramatic roles.

C. Scenario programming

1. Optimal management path: Emphasis should be placed on the trainee performing all steps rather than doing so in perfect order.
2. Potential complications path(s): If time is limited for the lab, review of background slides can be deferred. If more time is available, optional cases can be discussed (i.e. Case 4 uterine perforation)
3. Potential errors path(s): If a trainee feels their evaluation was not scored correctly, the trainee can be reassessed with an Instructor Evaluator.
4. Program debugging: Opportunities to improve of the simulation lab should be considered after every session both in terms of the timing, logistics, and modifications for different levels of trainees.

VIII. Debriefing Plan

A. Method of debriefing – individual, group, knowledge support items

1. Classroom Simulation: After each individual trainee runs through the simulation, they should be asked how it went, and then review their Observed Performance Assessment Form with the Evaluator for steps completed, missed, and areas for improvement. And after all trainees have run through the simulation, the Instructor can debrief with the entire group for frequently missed steps to reinforce learning points, and address any systems level limitations and changes to be considered.
2. Clinic Simulation Exercise: Clinic simulation and debriefing is a strategy to enhance teamwork, reduce medical errors, and reinforce safety in clinical settings. After running through the simulation once, the exercise should be debriefed as an entire group for steps missed and what could be added. Specific questions and teaching points are provided in the Clinic Simulation Guide (Debrief and Teaching Point Section). If time allows, re-run the exercise with second quick debrief.

B. Actual debriefing materials:

1. Classroom: The Observed Performance Assessment Form should be reviewed for individual debrief.

2. Classroom: The Post Session Evaluation has questions that can be reviewed on the overall session.
3. Clinic Simulation: Guide includes Debrief and Teaching Point Section with specific questions.

D. Rules for the debriefing

1. Emphasis should be placed on positive actions of individuals instead of blaming, and on systems improvements for individual and clinic settings for maximal impact.

E. Questions to facilitate the debriefing
1. Classroom: See Pre-Post Evaluation, then ask group:
    a. What were common pitfalls in the simulation?
    b. What would you change to improve the simulation?
    c. What criteria would you use to observe vs. transfer?
2. Clinic: See Debrief Questions and Teaching Points.

IX. Pilot Testing and Revisions

1. Numbers of participants
   The Classroom Simulation has been piloted in groups from 10 - 30 learners. We recommend recruiting an additional instructor for groups larger than 15, to help to ensure that learners receive individual instruction.
2. Performance expectations, anticipated management mistakes
   It is valuable to maintain roles throughout to improve fidelity of the simulation, allow ample problem solving, and learn from the debriefing process.
3. Evaluation form for participants
    a. For Classroom Simulation, participants are responsible for filling out a pre- and post-session evaluation that assesses knowledge, comfort, and self-assessed confidence with hemorrhage management skills, as well as assessment of usefulness of the session. Performance success would be to name and / or perform 75% of the steps in management algorithm
    b. For Clinic Simulation, the focus is on debrief rather than evaluation.

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