

Online Resource 1: Simulation Model Construction Instructions

The following instructions describe the materials and assembly steps for the three low-cost simulation models used in this benign anorectal simulation lab. Models were adapted from previously described methods. Estimated per-model costs are provided; all materials are commercially available.

Model 1: Hemorrhoidectomy and Rubber Band Ligation

Estimated cost per model: \$2.98

Instruments used during simulation: McGivney band ligator, scalpel, Addison's forceps, DeBakey forceps, 2-0 Vicryl suture, 2-0 Prolene suture

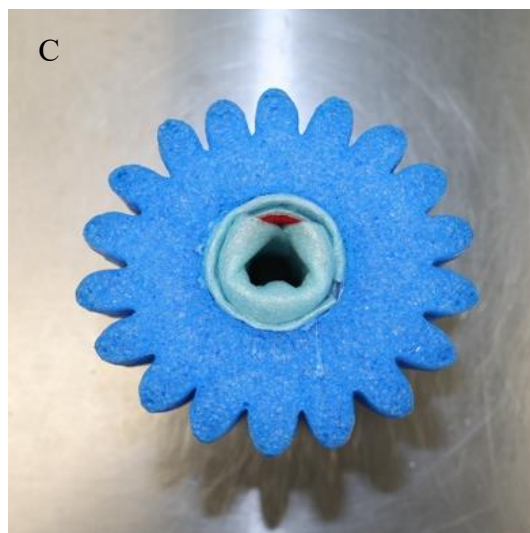
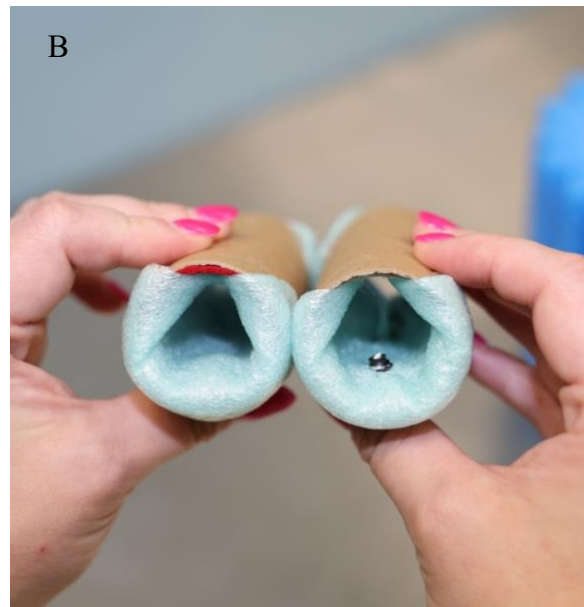
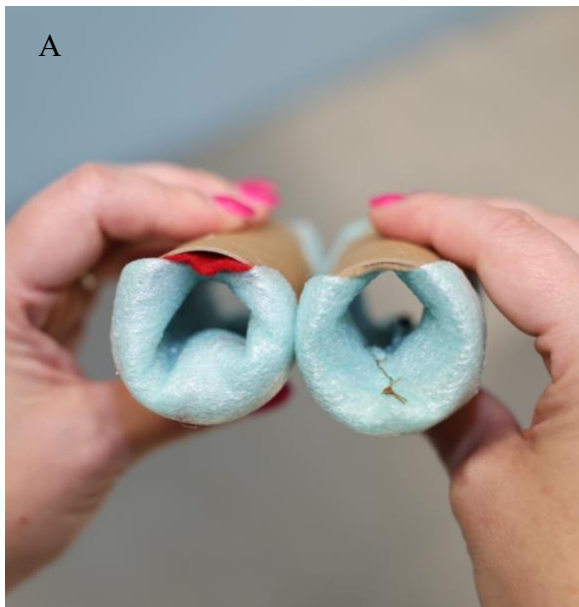
Materials (per model)

- 1 [cardboard toilet paper roll](#)
- Felt (approximately 4" × 6" strip per model)
- Modeling clay or [Sculpey](#)
 - Larger mound (~2 cm diameter) for hemorrhoidectomy model
 - Smaller nodule (~1 cm diameter) for banding model
- [Double-layered packing foam sheet](#) (approximately 6" × 8" per model)
- [Tacky glue spray](#)
- Hot glue gun and glue sticks

Construction Steps

1. Cut a strip of felt sized to line the inner circumference and length of the inner part of the toilet paper roll. *This felt layer represents the anorectal mucosa and provides a tissue-like surface for suturing and banding.*
2. Apply hot glue to the interior surface of the toilet paper roll. Press the felt strip firmly against the inner wall and allow to adhere fully.
3. Shape a mound of modeling clay to simulate the hemorrhoidal tissue. For hemorrhoidectomy models, form a larger, more prominent mound (A). For banding models, form a smaller, more discrete nodule (B).

4. Adhere the clay hemorrhoid to the interior rim of the felt-lined roll, placing the larger and smaller pieces on opposite ends of the tube using hot glue
5. Cut the double-layered foam sheet into two rectangles approximately 6–8 inches in diameter) and use tacky spray to adhere them together. Place this doubled foam sheet inside the tube overtop the modeling clay, with excess foam sticking out of each end. Fold the excess around the edge of the tube on both sides.
6. Using hot glue, adhere the foam sheet to the outside of the toilet paper roll.
7. Allow all adhesive to dry fully before use.
8. At the time of the simulation, position the assembled model upright on the table or within a foam holder to simulate the operative position (C). Residents perform either rubber band ligation using the McGivney ligator on the smaller nodule, or excisional hemorrhoidectomy on the larger nodule.



Model 2: Anal Fistula Probing and Seton Placement

Estimated cost per model: \$7.75

Models constructed: 4

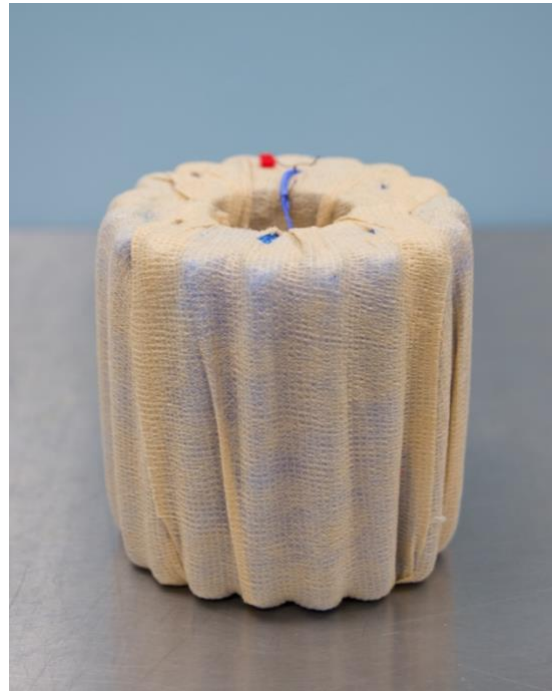
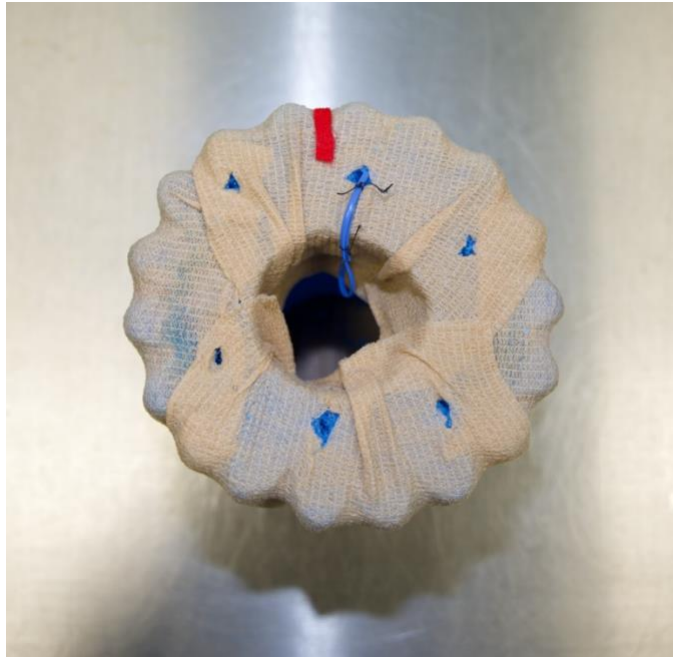
Instruments used during simulation: Fistula probes, vessel loops (used as setons)

Materials (per model)

- [1 foam ring](#) (pool noodle “booster” or pre-formed foam ring, approximately 4–6" outer diameter)
- 3" Coban® self-adherent wrap (1 roll per model)
- Hot glue gun and glue sticks
- Fistula probes (provided separately for use during simulation; not consumed)
- Vessel loops (used as setons; provided separately for use during simulation)

Construction Steps

1. Select a foam ring with a central aperture sized to represent the anal canal (approximately 1–1.5" inner diameter).
2. Starting at the outer circumference, tightly wrap the foam ring with Coban self-adherent wrap, working in overlapping layers to fully cover the exterior surface, using hot glue to adhere where needed. The Coban provides tissue-like resistance and a surface that responds to probe manipulation. Secure the wrap end with a small amount of hot glue.
3. Cut slits in the Coban®, separated by a few inches between slits. Using a sharp fistula probe or curved forceps, create multiple fistula tracts through the foam.
 - Pierce from the outer circumference inward toward the central lumen, varying the angle, depth, and branching of each tract to simulate fistulas of varying complexity
4. Aim to create 4–6 distinct tracts per model at varied angles (e.g., anterior, posterior, and lateral positions; acute and obtuse angles relative to the central axis). This allows multiple residents to practice probing different tracts on the same model.
6. At the time of the simulation, residents insert a fistula probe into a tract from the central aperture, navigate through the foam to identify the external opening, then thread a vessel loop through the identified tract and tie it as a seton, practicing various ways to secure setons.
 - Hydrogen peroxide injection is difficult as it is absorbed by the foam



Model 3: Abscess Incision and Drainage with Mushroom Catheter Placement

Estimated cost per model: \$7.62 (fully loaded, including reusable pelvic base); \$4.28 (excluding reusable pelvic base); \$1.88 (consumable materials only)

Models constructed: 30 (2 abscesses per complete model; pelvic base reused across sessions)

Instruments used during simulation: Scalpel, hemostat, saline and syringes, mushroom (Malecot) catheter, packing gauze

Materials

Abscess Models (2 abscesses per complete model, consumed each session)

- Rolled oats
- Psyllium fiber powder (e.g., Metamucil®)
- Water
- Balloons (2 per model)
- Felt (approximately 6" × 8" sheet per model)
- [Thin plastic sheet or plastic tablecloth](#) (approximately 6" × 8" per model)
- Polyester batting
- Ioban® drape or similar sticky sheets or wrap (approximately 12" × 8" per model)

Reusable Base

- [Anatomic pelvis model](#) (purchased once; reused across all sessions)
- Velcro strips (hook-and-loop; adhered to abscess model and pelvis model base)

Construction Steps

Preparing the Abscess Models

1. Place rolled oats and psyllium fiber powder into balloons. Fill each balloon with a few tablespoons of water. Tie off the balloon securely. Prepare two balloons per complete model.
2. Cut a template out to match the size and shape of the pelvis model (if using), used to cut out the felt and plastic table cloth to size.
3. Cut 2 pieces of felt and 2 pieces of thin plastic sheet per model using the template.

4. Layer the materials around the two filled balloons in the following order from inside to outside: thin plastic sheet → felt (innermost, against the balloon) → balloons interspersed with polyester batting → felt → thin plastic sheet (B). This layering simulates the perirectal soft tissue planes encountered during incision and drainage.
5. Open up a sheet of Ioban[®], careful to not have it stick to itself. Place the U-shaped layered pieces to the Ioban[®]. Fold it overtop and wrap up the sides on the outside and inside of the U-shape, pressing firmly to secure all layers. Ensure the layers are applied tightly enough that the balloon is not immediately visible but remains accessible to incise during the simulation.
6. Adhere a strip of Velcro[®] to the flat base of each abscess model in corresponding areas to Velcro[®] placed on the plastic pelvis model (C).

Preparing the Reusable Pelvic Base

7. Adhere corresponding loop Velcro strips to the anatomic pelvis model at the positions where the abscess models will be attached, e.g. top and left and right sides (C).
8. Press the abscess models onto the pelvis model using the Velcro attachment. Orient the pelvis model pronated or on its side to simulate lateral decubitus patient positioning inside a foam headrest or foam support, simulating the typical positioning for patients undergoing this procedure (D).
9. After use, the used abscess models are discarded and replaced with fresh models for subsequent participants. The pelvic model base is wiped down and reused.



