

Teaching medical procedures at your workplace

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Family physicians frequently teach procedures in their offices, in academic settings, or in hospitals. This is not an easy task in the midst of busy schedules with various time constraints. Physicians attached to universities or hospitals (hospitalist or emergency department work) might have access to teaching aids or some structured forms of instruction; however, community family physicians frequently lack these resources for procedural teaching.

Similarly, family medicine residents have little exposure to procedures because of busy office environments, limited structured procedural training in residency programs,¹ and reduced contact with patients owing to shorter hospital admissions.² These factors contribute to family medicine residents' lack of confidence in their ability to perform procedures.^{3,4}

The purpose of this article is to provide specific tips and resources that can be used by family physicians in any environment during daily teaching of procedures.

Changing and evolving procedural teaching

Procedural training in family medicine has traditionally been an assumed activity without a formal educational context and lacking structured methods.^{1,5}

A traditional method of instruction has been the "see one, do one, teach one" approach, but more recent studies have demonstrated that more comprehensive methods of psychomotor training are needed to impart the required skills.^{1,6} This traditional method is inadequate, as it only focuses on the technical part of the procedure, lacks cognitive components for teaching procedures, does not include instructional learning opportunities in preparing for the procedure, and lacks adequate observation of the learner's performance.

Current practising and teaching medical environments call for more robust and adequate teaching methods to impart psychomotor skills.⁷ Canadian family physicians are required to provide comprehensive care for patients including the performance of procedures. Therefore, demonstration of competence in a list of core procedures⁸ is a requirement of the College of Family Physicians of Canada for Certification after residency training in order to ensure comprehensive care in any Canadian community.^{8,9}

In addition to teaching technical skills, procedural teaching should include a cognitive component,

adequate feedback, and an assessment process for learners and should maintain a patient-centred approach. It is recognized that procedures should be taught within a structured framework.

The recent literature related to this topic has focused on suggesting teaching frameworks and methods of instruction. A recent review by Sawyer et al provides an evidence-based framework that builds on earlier models of procedural teaching.¹⁰ This model of training includes 6 steps: learn, see, practise, prove, do, and maintain (Table 1). This article uses that framework to describe a rationale and tips for teaching procedural skills.

Procedural training in daily practice

Learn. This step is also known as *cognitive conceptualization*. In this part of training the learner should obtain not only an understanding of the technical steps to perform the procedure, but also the rationale for the procedure. This includes learning the indications, contraindications, possible complications, risks, and benefits of the procedure, as well as the alternatives to the procedure. Although it might appear to be a simple step, it is frequently overlooked as an important component of teaching procedural skills. Without this knowledge the learner will not be able to correctly explain the procedure to the patient or obtain adequate informed consent. Further, without this knowledge erroneous therapeutic decisions can be made.

A didactic session provided by postgraduate programs can be the ideal approach to completing this part of the learning. If these sessions have been provided to residents, the community family physician will be able to easily build on this previous knowledge. If such an instructional session has not been provided, the teacher must ensure the knowledge is obtained before the resident has contact with the patient.

Practical tips: Ensure residents read about the procedure to be performed. Having books available at your clinic that describe procedures is useful, but it is also convenient to have written summaries prepared in advance that can be quickly read during clinic time. Such written material could include summary sheets, procedure descriptions, comprehensive informed consent forms, and patient questionnaires that can be used by the resident to lead informative conversations.

Ensure residents check the patient schedule in advance in order to prepare for the procedures.

There are resources available for procedural teaching; online medical education repositories such as MedEdPORTAL (Box 1) provide such teaching resources for various procedures.

La version en français de cet article se trouve à www.cfp.ca dans la table des matières du numéro d'avril 2016 à la page e222.

Table 1. Summary of guidance points for procedural instruction

| TEACHING STEP | WHAT YOU CAN DO AT YOUR WORKPLACE |
|---------------|--|
| Learn | <p>Ensure residents check the patient schedule in advance in order to prepare for the procedures</p> <p>If the resident has not completed the learning phase, provide resources specific to the procedure (readings, watching a video, completing teaching modules, verbal explanations)</p> <p>Determine if the resident has had previous direct exposure to the procedure (performed or witnessed) and his or her level of expertise</p> <p>Ensure all surgical teaching elements are in place (adequate booking time to allow teaching, surgical instruments, informed consent forms)</p> |
| See | <p>Establish technical understanding of the procedure based on the learner's description and articulation of each required step</p> <p>Use validated teaching methods or teaching aids (Boxes 1 and 2) for specific procedures to impart skills</p> |
| Practise | <p>Use simulation methods to teach and assess technical skills before the resident performs procedures on patients</p> <p>Clarify questions and inquiries before the procedure</p> |
| Prove | <p>Prepare the surgical teaching encounter in advance</p> <ul style="list-style-type: none"> • Appraise the resident's technical understanding of the procedure, including anatomy • Determine if the resident has a conceptual understanding of the procedure (risks, benefits, alternatives, indications, contraindications, complications, and surgical technique) • Assess if the resident has specific learning challenges or natural abilities |
| Do | <p>Based on your assessment and the resident's level of understanding of the procedure, determine the level of independence to be given to the resident while performing the procedure</p> <p>Ensure the resident records the performance of the procedure in the appropriate format (eg, logbook, card of performance, online tracking system) for proof of proper training and for ensuring readiness for Certification, if required</p> <p>Provide feedback</p> <ul style="list-style-type: none"> • Immediate: during procedure performance • Delayed: in regards to interaction with the patient about serious procedural concerns • Comment on correct and incorrect techniques |
| Maintain | <p>In all circumstances, ensure complete patient safety</p> <p>Provide information on simulation sources available to maintain competence</p> |

Box 1. Examples of teaching modules and guides for teaching procedural skills

MedEdPORTAL teaching resources (sign-in required; free registration)

- A comprehensive infant lumbar puncture novice procedural skills training package: an INSPIRE simulation-based procedural skills training package: www.mededportal.org/publication/9724
- Bone marrow aspirate and biopsy: an instructional video: www.mededportal.org/publication/9018
- Infant lumbar puncture: POISE pediatric procedure video: www.mededportal.org/publication/8339
- IUD insertion: a versatile teaching and evaluation module (video, learner's written material, teacher's guide, evaluation tool): www.mededportal.org/publication/10014
- Lumbar puncture procedure module: www.mededportal.org/publication/8201
- Lumbar puncture step by step: www.mededportal.org/publication/326
- Teaching incision and drainage of abscess (evaluation tool): www.mededportal.org/publication/9736
- The papaya workshop: using the papaya to teach intrauterine gynecologic procedures (facilitator guide, learner handout): www.mededportal.org/publication/9388
- Tying the surgical square knot (video): www.mededportal.org/publication/7817

IUD—intrauterine device.

See. This step involves demonstrating the procedure to impart procedural knowledge. The teacher can achieve this by using videos or by direct demonstration when a class session has not been completed. In either case, the demonstration should include specification of correct and incorrect techniques to obtain clear understanding.

Comprehensive instructional videos that use principles for designing e-learning materials might be better than simple demonstrative videos that are available on the Internet.

Practical tips: If you are demonstrating the procedure, make a conscious effort to individualize each step. At the same time, provide explanations to articulate the different parts of the procedure. Do not forget to use adequate terminology for the resident's level of training; for example, for a resident who is naïve to the procedure, avoid technical jargon such as "Because the wound is under tension, just do 3 far-far, near-near vertical mattress suture stitches to secure closure."

Have videos or links to videos that describe and demonstrate the procedures available at your clinic, either on your smartphone or tablet or on a desktop computer. Academic videos are available on various websites (**Box 2**).

Practise. In this step, psychomotor skills are acquired. Ideally this step should be done before patient contact, but commonly it is performed on real patients if

Box 2. Examples of videos for procedural teaching

Canadian Family Physician video series (open access): www.cfp.ca/content/by/section/Video%20Series

- Cryotherapy
- Eye tonometry
- Elliptical excision
- Draining a subungual hematoma
- Intra-articular knee injections
- Pilar cyst excision
- Punch biopsy
- Toenail resection
- Skin tag removal
- Subacromial shoulder injection
- Vasectomy

New England Journal of Medicine videos (sign-in required; registration through university library): www.nejm.org/multimedia/medical-videos

- Abscess incision and drainage
- Arterial blood gas sampling
- Arthrocentesis of the knee
- Bone marrow aspiration and biopsy
- Central venous catheterization
- Chest tube insertion
- Cricothyroidotomy
- Endometrial biopsy
- Internal jugular vein cannulation
- Laceration repair
- Lumbar puncture
- Nasogastric intubation
- Orotracheal intubation
- Paracentesis
- Peripheral intravenous cannulation
- Splinting techniques
- Subclavian vein catheterization
- Thoracentesis
- Urethral catheterization (female, male, male children)

ClinicalKey (free access to members of the Canadian Medical Association; also registration through some university libraries): www.clinicalkey.com

- Abdominal paracentesis
- Amniotomy
- Anoscopy
- Arterial blood gas sampling
- Arthrocentesis (knee, ankle, elbow, metacarpophalangeal joint, metatarsophalangeal joint, shoulder, wrist)
- Biopsy (punch, shave)
- Bladder catheterization (male, female)
- Cerumen removal
- Chest tube placement
- Colposcopy
- Cryosurgery
- Curettage and cautery
- Electrosurgery
- Endometrial biopsy
- Epistaxis management
- Excisional biopsy
- Forceps delivery
- General splinting techniques
- Incision and drainage of cutaneous abscesses
- Knee injection
- Local anesthesia
- Lumbar puncture
- Marsupialization of the Bartholin gland
- Papanicolaou tests
- Paracentesis
- Repair of perineum
- Shoulder injection
- Splinting (arm, leg)
- Vacuum-assisted delivery
- Vaginal delivery
- Vasectomy
- Vulvar biopsy
- Wart treatment

no academic session has been completed. The ideal method for this step is simulation, which can be done in the office setting. It is very important to include feedback in this part of the training; feedback is more useful when it is direct and immediate. Many studies have shown that expert feedback enhances the learner experience and leads to better performance.

Practical tips: Take time to obtain simulation materials that can be on hand at any time in your office. There are easily available devices that can be used (eg, any threads or laces to practise surgical knots; fabric or cloth materials to practise stitching). You can obtain simulation kits and simple anatomical demonstration models for specific procedures (eg, intrauterine device insertion) from manufacturing companies. You can obtain demonstrator devices from donations from altruistic societies (eg, breast or prostate models). Use various types of fruit as simulation devices (papayas for gynecologic procedures; bananas for toenail resections; oranges for punch, shave, and excisional biopsies). Borrow simulation devices from postgraduate

programs or manufacturing companies (eg, limb simulators for joint injections).

Keep in mind residents' different learning styles and their natural abilities, as well as the challenges to learning procedures. For example, sometimes the learner should be on the same side of the surgical table to understand the steps, as 10% of the population learns by spatial orientation and muscle memory (kinesthetic approach).

Prove. It is important to demonstrate a resident's comprehension of the procedure. Before performing the procedure, the resident should be able to verbalize and describe its different steps. It is useful to challenge the learner with questions.

Practical tips: Here are some examples of questions to prove a resident comprehends various aspects of the procedure.

- Basic knowledge: What are the anatomical landmarks for the shoulder injection you plan to perform?
- Specific technical points: What number scalpel blade do you use for this procedure?

- Interaction with the patient: What alternatives to the procedure do you plan to discuss with the patient?


Do. This includes the learner's performance of the procedure in the practice setting with patients. During a discussion with the resident before the procedure, the teacher can assess the resident's level of understanding of the procedure and can focus teaching on specific needs. There are several things the teacher needs to determine: if he or she should demonstrate the procedure to the resident again; if the resident should be allowed to provide only surgical assistance; if the resident should be allowed to perform parts of the procedure; and whether to assist the resident while he or she performs the procedure. Given that it is more difficult to correct wrong techniques once they have been learned, the resident should always be closely observed to avoid learning incorrect techniques.

Practical tips: Always add positive or invitational comments about the procedure to increase motivation (eg, "Removing a sebaceous cyst will offer you specific challenges, as an adequate removal should be performed without breaking the capsule").

Maintain. It is of great importance to teach learners to maintain competence in the skills they have acquired or to acquire additional training in new procedures that are part of new standards of care (eg, botulinum toxin injections for migraines, dermoscopy).

Practical tips: Provide information to learners about simulation sources available to maintain skills competence (eg, conferences with procedural workshops such as Family Medicine Forum, annual scientific assemblies, St Paul's Hospital Continuing Medical Education, local activities).

Conclusion

Teaching procedural skills is an important part of a family physician's practice. A structured method of instruction should be used for training that is comprehensive and provides the breadth of skills needed to perform according to the current standards of medicine. 

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Competing interests

None declared

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TEACHING TIPS

- Demonstration of competence in various procedures is a requirement of the College of Family Physicians of Canada for Certification after residency training in order to ensure comprehensive care in all communities. Procedural teaching should include a cognitive component, specific technical skills, adequate feedback, and an assessment process for learners and should maintain a patient-centred approach.
- Procedures should be taught within a structured framework; the 6-step model of learn, see, practise, prove, do, and maintain is a structured method of teaching that is comprehensive and provides the breadth of skills needed to perform procedures according to the current standards of medicine.
- There are many online medical education resources that can be used by family physicians in any environment during daily teaching of procedures.

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