Remote synchronous toenail procedure training using a sausage model

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ABSTRACT

Objectives: Social distancing practices brought on by the COVID-19 pandemic have limited the ability of residency training programs to deliver procedure training via traditional in-person methods. Financial strains brought on by the pandemic also mean that fewer resources may be available to develop novel teaching processes. We sought to investigate a protocol meant to address the rising need for inexpensive procedure training that can be performed remotely or in a socially distanced manner.

Methods: We used a sausage model to train 11 family medicine residents in toenail procedures. The training was delivered via two-way video telecommunication as the residents were separated into small groups in separate rooms. Learners were given a cognitive skills evaluation and were asked to perform a self-assessment of their confidence with procedures using a scale of 1–10. These assessments were administered before and after the procedure and the results were compared using a paired t-test.

Results: The cognitive score improved from a pretest average of 73.6% to a posttest average of 86.0% (P = 0.022). The improvements in trainee self-assessment were significant for all performance characteristics of the procedure.

Conclusions: This evidence supports the use of synchronous video communication to train family medicine residents in toenail procedures using a sausage model.

1. Introduction

In early 2020, COVID-19 and the resultant social distancing norms dramatically disrupted graduate medical education[1]. As this novel virus has pushed residents and faculty outside the corners of the classroom, it has provided impetus for developing novel and innovative methods for teaching residents. Since traditional large gatherings are not feasible in a socially distanced environment, residency programs have been forced to rethink optimal methodology for delivering both cognitive and procedural education. Decades of research build a foundation for cognitive e-learning; however, best practices for remote training of procedural skills in primary care training presents a clear gap in our teaching experience [2–4].

In both academic and community-based family medicine residencies, most of the procedural training has been delivered in-person. Traditionally, faculty and more experienced residents instruct learners directly and supervise their performance on models or patients. With the implementation of social distancing requirements, the in-person traditional method of teaching procedures presents logistical barriers necessitating innovative pedagogical development.

Community-based residencies typically face further obstacles with regard to education innovation[5]. When compared with academic residency programs, they often have fewer models and materials and more limited allocation of time and finances for educational endeavors [2,6]. Smaller core faculty groups also have difficulty in arranging for direct supervision and providing real-time performance feedback in the remote setting. To compound matters, the COVID-19 changes have led to progressive resource constraints on healthcare institutions[7].

At the outset of a pandemic, it is critical we do not provide substandard training to the future generation of physicians[1]. Fortunately, audio and video technologies have been developed as well as become more readily available and affordable in the recent years. Also, expensive high-fidelity models are frequently not required [8,9]. Excellent education can be performed on models constituted from household items and materials obtained in grocery and hardware stores.

2. Methods

Utilizing inexpensive supplies for creating the model and ubiquitous communication devices (e.g., cell phones), we developed a remote training curriculum to educate residents in the treatment of ingrown

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toenails. The objective in this exercise was to develop a novel approach to teach common procedures for treatment of ingrown toenails while respecting social distancing in a financially-constrained environment. This study was exempt from review by the institutional research review board.

A total of 13 residents from a community-based family medicine residency program participated in the remotely delivered procedural skills training workshop. Prior to the workshop, learners were given a pretest which assessed their cognitive understanding of the subject matter. The pretest also included a self-assessment regarding their confidence on a scale from 1 (not confident at all) to 10 (highly confident) in the following aspects of the procedure: 1) knowing the indication of each procedure; 2) explaining the risks, benefits and alternatives of each procedure; and 3) performing each procedure. Once the pretest was returned, residents were provided with reading materials which they were asked to review prior to the workshop [10,11].

The procedure skills training workshop was administered via two-way video conferencing with residents separated into groups of two or three in separate rooms. The educator broadcast the demonstration from a standard tablet device. The tablet was laid down horizontally on a shelf with the camera pointed vertically downwards at the demonstrator’s hands so that the performance of the procedure was visible to each learner from an overhead view. Learners using either tablets or laptop computers viewed the demonstration while the camera showed their faces. Showing the learners’ faces allowed the lecturer to assess learner engagement in real time.

The rooms had equipment set up for each learner to perform the following procedures: digital block, nail gutter splint, nail edge excision, and nail edge excision with phenol matricectomy (i.e., phenolization) (Figure 1). The model used for the digital block and nail procedures was a Polish sausage with an artificial nail embedded at one end. The sausage also had plastic rods inserted through the middle to simulate bone (Figure 2).

During the training, the lecturer demonstrated the steps of a procedure while the learners performed it simultaneously. Time was allowed for questions, and the learners performed the procedure again. The lecturer then began discussing the next procedure. The training was provided over a space of three hours. Following the training, the learners were asked to again fill out the cognitive evaluation and the self-assessment.

3. Results

Before and after the training, learners were asked to assess their confidence in knowing the indications of each procedure; discussing the risks, benefits, and alternatives of each procedure; and performing each procedure. The improvements in trainee self-assessment were significant for the majority of the procedures (Table 1).

The learners were also given a cognitive assessment both before and after the training. The cognitive score improved from a pretest average of 73.6% to a posttest average of 86.0% (p = 0.022).

4. Discussion

This method for teaching residents to remotely perform toenail procedures was successful in achieving the educational goal of improved learner confidence and improved knowledge. It was also successful in achieving the pragmatic goals of being inexpensive and possible to implement without specialized equipment.

The strength of our conclusions regarding the effectiveness of this training method is limited due to the fact that we could not compare it with live training. Further study would be required to determine whether this delivery method for procedural skills training is at least as effective as traditional in-person methods. Further studies should also be performed in other educational settings and with other learning models to assess whether these findings apply more broadly.

The primary driver of this assessment was the forced social distancing required by COVID-19. However, this delivery method for toenail training could also be used in environments where learners are routinely separated from each other, such as rural training programs or large programs with multiple sites.

| Table 1. Resident self-assessment scores. |
|------------------------------------------|
|                                             |
| **Indication pre** | **Indication post** | **P-value** | **R/B/A pre** | **R/B/A post** | **P-value** | **Performance pre** | **Performance post** | **P-value** |
| Digital block       | 7.27                | 8.91        | 0.042         | 7.18           | 8.64        | 0.024         | 6.45           | 9.00         | 0.005       |
| Conservative treatment | 6.18              | 8.73        | 0.018         | 6.36           | 8.82        | 0.040         | 6.09           | 8.73         | 0.012       |
| Gutter splint       | 4.18                | 8.55        | P < 0.001     | 4.55           | 8.36        | 0.002         | 3.82           | 7.91         | P < 0.001   |
| Edge excision       | 5.27                | 8.27        | 0.002         | 5.27           | 8.45        | 0.003         | 4.55           | 7.82         | 0.001       |
| Phenolization       | 4.09                | 8.09        | P < 0.001     | 5.18           | 8.27        | 0.003         | 3.73           | 7.55         | P < 0.001   |
Ethical approval

Under 45 CFR 46.101 (b) (Department of Health and Human Services (DHHS)) this research is exempt from IRB approval because the involvement of human subjects is in the following category:

(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

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