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A Low-Cost, Reusable, Three-Dimensional Printed Ultrasound Phantom for Simulation of Knee Arthrocentesis

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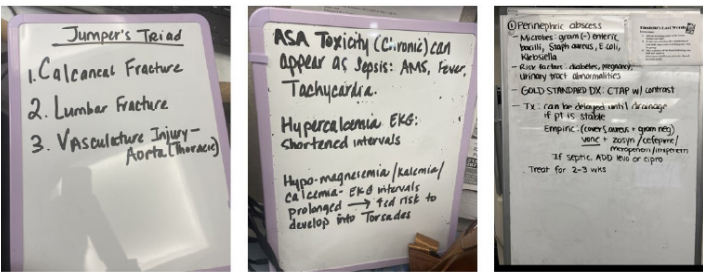


Figure 1. Examples.

19 Palliative Care Needs Assessment for Emergency Medicine Residents

Meghan Harrington, Kent McCann

Introduction: In 2012, ACEP created a palliative care (PC) subgroup to study the intersection of EM and PC; they developed a list of provider skills that integrate primary PC with concepts relevant to EM.

Objectives: This needs assessment explored how Baystate EM residents rate: 1) the importance of PC skills in EM, 2) the teaching they have received, and 3) their comfort level with these skills, all to assess whether more training is needed.

Methods: We developed a survey based on current literature that was sent to EM residents in one program. Likert scale 1-5 was used to establish proportions of respondents who agreed or disagreed with statements and Z-tests were used to obtain p values. A priori, we intended to test the following hypotheses: 1) more participants will feel PC skills are important than feel teaching is sufficient; 2) more participants will feel PC skills are important than feel personally comfortable exercising the skill; and 3) participants will feel teaching is insufficient at the same rate that they feel uncomfortable.

Results: Of 47 residents, 32 responded (68%). When accounting for any given skill surveyed, 75 to 100% of residents feel the skill is important, 3 to 34% feel the teaching of that skill is sufficient (18 to 74% feel it is insufficient), and 9 to 46% feel comfortable exercising the skill (while 6 to 53% feel uncomfortable). For hypotheses 1 and 2, the null was rejected across every skill. For hypothesis 3, the null failed to be rejected for all but five skills. Participants were also surveyed on preferred learning modalities, and bedside teaching and small groups tied for top vote.

Conclusions: Results suggest that EM residents find PC skills important but do not feel comfortable exercising them. The lack of significant difference between the proportion who felt uncomfortable and the proportion who reported insufficient teaching suggests an association between teaching and comfort. Over 53% of residents reported

feeling uncomfortable with family witnessed resuscitation, the highest proportion of any skill. Results suggest that a simulation with subsequent debrief (a practical application of both bedside teaching and small groups), would be effective to improve the skill of running a family witnessed resuscitation.

Provider Skill	Reported Important	Reported Sufficient Teaching	Reported Insufficient Teaching	Reported Comfortable	Reported Uncomfortable
Pain control	96.9	28.1	18.8	43.8	6.3
Treating distressing non-pain symptoms	78.1	18.8	34.4	34.4	18.8
Difficult communication	100	21.9	25	37.5	21.9
Goals of care discussions	93.8	28.1	37.5	46.9	25
Caregiver support	75	3.2	74.2	18.8	43.8
Non-initiation or stopping of non-beneficial interventions	90.6	12.5	46.9	37.5	37.5
Treating common end-of-life symptoms	96.9	18.8	28.1	31.3	15.6
Care for the imminently dying and their family	90.6	15.6	50	28.1	28.1
Bereavement and grieving	87.5	3.1	59.4	18.8	34.4
Family witnessed resuscitation	100	9.4	65.6	9.4	53.1
Caring for patients under hospice care	87.5	9.4	68.8	15.6	25
Coping and self-care	90.6	34.4	37.5	†	†

Figure 1. Proportion (%) of respondents reporting importance, sufficiency of teaching, and comfort with palliative care skills. Denotes field that was unintentionally omitted from questionnaire and thus no data is available. Important = Likert 4 and 5 on a scale of very unimportant to very important. Sufficient Teaching = Likert 4 and 5 on a scale of none to more than enough (Insufficient = 1 and 2) Comfortable = Likert 4 and 5 on a scale of very uncomfortable to very comfortable (uncomfortable = 1 and 2)

20 A Low-Cost, Reusable, Three-Dimensional-Printed Ultrasound Phantom for Simulation of Knee Arthrocentesis

Shivani Ruf, Sara Baker

Introduction: Arthrocentesis is a common ED procedure that can quickly differentiate between a limb-threatening infection and a benign inflammatory reaction, but EM physicians get less practice with this procedure as many train at programs with orthopedic residencies. EM residents would benefit from arthrocentesis simulation. Commercial simulation phantoms are expensive. Previous homemade models have been limited by lack of US-compatibility and anatomical accuracy.

Educational Objectives: The objective was to create a

low-cost, reusable, anatomically accurate simulation phantom for US-guided knee arthrocentesis as well as to determine the educational effect of practicing on this homemade model.

Curricular Design: To create this model, a mold was created of a human knee. A digital model of the knee joint was downloaded from Thingiverse, an open-source three-dimensional (3D)-printing website. A mold for the simulated synovial fluid bladder was designed, printed, and then cast with silicone. The Creality K1 3D printer was used for all prints. Nylon filament was selected for most prints due to its heat-resistant properties that prevent warping when cast in ballistics gelatin. Simpler bladders were trialed but were incompatible with high temperatures or not representative on US imaging. After assembling the knee skeleton and bladder and placing this structure within the knee mold, heated ballistics gelatin was poured in. After cooling, the cast model was removed and ready for use. EM residents then participated in a workshop that included instruction and practice of US-guided knee arthrocentesis.

Impact/Effectiveness: This knee phantom improved upon previous models and allowed for realistic practice of the procedure. The curricular effectiveness of this knee phantom was assessed via analysis of pre- and post-workshop surveys which reported confidence with knee arthrocentesis and improved needle insertion/aspiration. Nonetheless, this knee phantom could be improved upon by making the model less translucent. To counteract lack of experience with 3D-printing/design, we made all of our digital models publicly available. Overall, we believe these phantoms can substantially improve the confidence and competency of learners' skills in US-guided procedures, beyond just knee arthrocentesis.



21 | Improving Faculty Performance in Providing Written Feedback to Learners

Kimberly Alford, Allison Schiller, Leigh Patterson

Background: Providing written feedback to ED learners on their clinical performance is key to supporting their development. ACGME and the Liaison Committee on Medical Education require that learners receive feedback in a timely manner to calculate their individual milestones or grades. Despite recognizing the importance of this task, faculty struggle to complete evaluations. Chairs struggle to incentivize teaching productivity.

Objectives: Improve the number of written evaluations completed by faculty working at an academic medical center. Success was defined as medical students receiving an evaluation for 100% of shifts worked and residents receiving an evaluation for 50% of shifts worked during each ED rotation.

Methods: To meet the objective, faculty targets were created and disseminated in the Spring of 2020. Interventions to incentivize faculty performance were added yearly for the next 4 years. First, faculty annual evaluations included the new targets. Next a dashboard was created to track evaluations completed by each faculty. Last, targets were incorporated into the faculty compensation plan. (Table 1) We retrospectively analyzed performance in the two years preceding interventions and the subsequent 4 years.

Results: In 2018-19, faculty completed evaluations on 77% of student shifts and 31% of resident shifts. Performance in both groups improved when targets were included in annual evaluations. Faculty evaluated >50% of resident shifts after the introduction of a dashboard. Faculty evaluated >98% of student shifts and >75% of resident shifts when targets were also included in compensation plan quality incentives. (Figure 1)

Conclusions: Faculty performance in completing learner evaluations improved significantly after creating targets and implementing a series of incentives and visual aids to track progress.

Table 1. Intervention timeline.

Academic Year	Intervention
2019-20	Chair and Education Vice Chair Created Faculty Targets for completing Learner Evaluations and Disseminated
2020-21	Targets incorporated into Annual Evaluation Rubric to Inform Faculty Teaching Scores
2021-22	Power BI Dashboard Created to Allow Faculty to Track their Individual Progress in Completing Resident Evaluations
2022-23	Targets incorporated into Medical School Compensation Plan as Quality Incentive Metrics
2023-24	Medical Student Tracking added to Power BI Dashboard and Timely Deadlines added to Rubrics