Developing Procedural Mastery With Slit Lamp Use

Take Home Point: Simulation-based mastery learning (SBML) intervention improved emergency physicians' confidence in performing and teaching slit lamp exams (SLE) to other clinicians, but this confidence waned after completing the training.

Citation: Hamou S, Ghiaee S, Chung C, et. al. Emergency Department Slit Lamp Interdisciplinary Training Via Longitudinal Assessment in Medical Practice. *West J Emerg Med*. 2024;25(5):725-734. doi: 10.5811/westjem.18514

Relevance: Procedural comfort and competence for a wide variety of minor procedures is a core aspect of urgent care (UC) and emergency medicine (EM) practice. Increasingly simulation-based training is being implemented to ensure standardized exposure for trainees in a controlled, low-stakes setting.

Study Summary: This was a multicentered project using the conceptual frameworks of the mastery learning model and rapid cycle deliberate practice (RCDP) to ensure proficiency among emergency physicians (EP) in performing a comprehensive SLE. The authors enrolled 15 EPs from an urban academic medical center in Philadelphia, Pennsylvania. The multidisciplinary research team created a longitudinal procedural curriculum that involved online and in-person training on SLE use and ability to identify pathology. The efficacy of the training was evaluated using the 4 levels of the Kirkpatrick model: improved learner confidence (level 1); knowledge acquisition (level 2); willingness of learners to incorporate their skillset in clinical practice (level 3); and ability to teach the content to learners (level 4). The participants' proficiency (via standardized examination) and confidence were both measured before beginning the program (Time 1), immediately upon completion (Time 2), and two months after completing the program (Time 3).

The participating EPs had nearly 8 years of post-clinical training experience. 73% of the participating EPs reported never or rarely performing SLEs before the training and only 20% felt confident in their slit lamp ability. After completing the SLE curriculum, there was a statistically significant improvement in 8 of 20 domains of slit lamp use tested. These included tasks such as sanitizing the chin and forehead rest before the exam and positioning the light source at 45 degrees to examine the anterior chamber. Immediately after completing the training (Time 2), the proportion of EPs who felt confident performing a comprehensive SLE was 87% and 73% felt more confident in teaching residents how to perform a SLE. The number of learners reporting that they were "very confident" or "extremely confident" in performing and teaching the SLE increased from Time 0-1, but then decreased from Time 1-2 (ie, 60 days after completing the course). There was no change in use of ophthalmology consultations between pre- and post-training surveys.

Editor's Comments: Availability of slit lamps in UC centers is highly variable. Currently, very few UC centers in the U.S. have a slit lamp, whereas the New Zealand "Urgent Care Standard" requires all UC centers to have the equipment. Both cost and clinician proficiency are major factors which influence an UC center's decision to acquire a slit lamp.

With the average slit lamp device costing between $5,000-10,000 USD, equipping America's nearly 15,000 existing UC centers would cost over $75 million USD. Because there is no unique billing (ie, CPT) code for a SLE, it is highly unlikely that the slit lamp will become part of standard equipment in U.S. UC centers until the economics of the situation change in a meaningful way.

In the hands of an appropriately trained clinician, the slit lamp is certainly a valuable piece of diagnostic technology and part of a standard, comprehensive eye exam. However, this study suggests that even residency trained EPs with an average of nearly a decade of post-graduate training mostly lacked proficiency and confidence in appropriate slit lamp without significant additional training. In recent years (and again for largely economic reasons) we have seen the UC work force in U.S. increasingly move towards advanced practice providers (APPs) with increasingly less prior independent clinical experience. The EPs in this study improved their confidence after investing considerable time in the simulation training, but the training was intensive, and their confidence waned within just a few months of completing the training.

Specialists and emergency clinicians frequently express concerns over the lack of specialized equipment of all vari-

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eties in UC centers. However, the ability of UC centers to provide high-value care relies on limiting investments in costly technology, especially those that are rarely used. For those who wish to continue to argue the necessity of ubiquitously available slit lamps, this study does little to support their argument. For instance, the EPs need for ophthalmology expertise was not affected by the training. Ultimately, data demonstrating that UC slit lamp use in a real-world setting either significantly reduces serious negative outcomes for patients or generates sufficient revenue to offset the costs of purchase, maintenance, and clinician training will be required to justify a change in the status quo. ■

Are We Overdiagnosing Pediatric Pneumonia?

Take Home Point: Emergency physicians (EPs) diagnosed pediatric ED patients with pneumonia nearly three times more frequently than a consensus panel who retrospectively arbitrated each case. The EPs, however, missed only 1 case of bacterial pneumonia. Cough >5 days in duration and nasal flaring were the only non-laboratory clinical findings predictive of pneumonia. However, many exclusion criteria and low rates of enrollment significantly undermine interpretability of this study's results.

Citation: Robinson J, Kellner J, Crotts J, et. al. Accuracy of the Diagnosis of Pneumonia In Canadian Pediatric Emergency Departments: A Prospective Cohort Study. *PLoS One*. 2024 Dec 11;19(12): e0311201. doi: 10.1371/journal.pone.0311201

Relevance: Pneumonia in children is relatively common, and is more commonly viral in etiology than in adult patients. Determining which pediatric patients with pneumonia are likely to have a bacterial etiology is important for preventing adverse outcomes, while avoiding unnecessary antibiotic prescriptions.

Study Summary: This was a prospective cohort study based in 7 pediatric EDs in Canada. Eligible patients were 3 months—16 years of age who presented to 1 of the EDs from 2008-2011 with fever and cough and in whom the treating emergency doctor ordered a chest x-ray. Patients were excluded if there was a presumptive diagnosis of croup, bronchiolitis, or asthma. Children were also excluded if they had chronic illness or were recently treated with antibiotics. The authors used standardized collection of history, physical examination findings, laboratory and microbial testing results, chest x-ray reports and telephone follow-up assessments after ED discharge for children clinically suspected to have pneumonia. Each case was subsequently reviewed by an independent panel of pediatrics specialists for a final consensus diagnosis as to whether the patient's presentation represented bacterial pneumonia, atypical bacterial pneumonia, viral pneumonia or not pneumonia. Complete blood count (CBC), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and blood culture were analyzed. Additionally, nasopharyngeal swabs were cultured for bacterial pathogens including pneumococcus, *Haemophilus* species, *Staphylococcus aureus*, group A streptococcus, *Moraxella catarrhalis* and *Bordetellae*. Viral panels were performed for influenza, adenovirus, bocavirus, endemic coronaviruses, enterovirus, human metapneumovirus, parainfluenza virus, respiratory syncytial virus (RSV), and rhinovirus. Phone interview of parents was used for follow-up at 7 and 28 days.

Of the initial 1,294 children who met the study eligibility criteria, 373 eligible patients did not participate because of parental non-consent. A total of 269 children were enrolled and data from 247 patients were analyzed. The authors found that EPs diagnosed bacterial in 51% of cases, whereas the consensus determined 18% of cases were likely bacterial in etiology. Laboratory tests, specifically elevated white blood cell, erythrocyte sedimentation rate, CRP, and procalcitonin were significantly better at predicting bacterial pneumonia when compared to clinical assessment. Detection of viruses did not exclude bacterial pneumonia with one-third of those with bacterial pneumonia had viral coinfection. Patients >6 years of age and those with cough >5 days in duration were more likely to have bacterial pneumonia.

Editor's Comments: There are numerous reasons why this study's results should be interpreted with caution by UC clinicians. The investigators cleverly developed a complex study design, likely partly out of necessity due to the difficulty of certainty in diagnosis of pneumonia and its etiology in children in an acute care setting. The data remarkably encompasses children seen 10-15 years prior to the study's publication and many of children who presented with cough and fever were not enrolled. Those with chronic diseases, recent antibiotic use, language barriers, and a presumptive diagnosis of croup, bronchiolitis, or asthma were excluded and over 50% of eligible patients remaining were not enrolled due to parental consent. In other words, the vast majority of children with cough and fever who presented to these EDs during the study period were not included in the data set.

Additionally, this study's aim was to determine which clinical, radiologic, and laboratory criteria were most useful

to predict bacterial etiology, however, this is not a patient-oriented outcome. The more important question is which children with cough and fever will benefit from antibiotics. This study unfortunately does not address this. The authors do not report which patients were hospitalized, had a return ED visit, or any type of long-term outcome. This is especially problematic because their statistical methods, which are appropriate, suggest that blood laboratory findings are more predictive of bacterial etiologies of pneumonia than clinical findings. While this may be true, it is precarious messaging to suggest that measuring serum inflammatory markers and a CBC should be routine practice on children who are being discharged from the ED or UC with pneumonia as a consideration. The American Academy of Pediatrics specifically does not recommend lab testing in children being treated as outpatients for pneumonia. This study did confirm that clinical findings are poorly predictive of a bacterial etiology. Finally, the molecular (ie, PCR) respiratory pathogen panel is a problematic gold standard. Studies show that asymptomatic colonization rates with *M. pneumoniae* up to 5% and as high as 30% for *S. pneumoniae*. Therefore, it is likely that some patients with viral pneumonia were incorrectly categorized as having bacterial pneumonia based on false positive respiratory pathogen testing.

Due to these issues, this paper does not significantly add to our understanding about the diagnosis or treatment of pneumonia in children. Checking labs or respiratory pathogen swabs can be costly and traumatic for children and parents, and this study avoids addressing the question: Does all this testing improve outcomes or reduce antibiotic prescriptions in children with suspected pneumonia? ■

Do Older Patients Really Need a CT Scan after Minor Head Injury?

Take Home Point: In this study, older adult patients with suspected head trauma who are alert and hemodynamically stable had a low incidence of a clinically important traumatic brain injury (ciTBI).

Citation: Mellet T, West C, Emeto T, et al. Evaluation of Older Patients With Minor Blunt Head Trauma To Identify Those Who Do Not Have Clinically Important Traumatic Brain Injury And Can Be Safely Managed Without Cranial Computed Tomography. *Emerg Med Australas.* 2024 Dec 5. doi: 10.1111/1742-6723.14540

Relevance: Age >65 years is an exclusion for both the NEXUS and Canadian Head CT rules. As most UC centers do not have access to immediate computed tomography (CT) scanners, UC clinicians often refer very low mechanism head injuries to emergency departments based solely on the patient's age. This can result in considerable expense and inconvenience for patients and their families for questionable benefit.

Study Summary: This was a single-site, prospective, observational cohort study based in a mixed, major referral emergency department (ED) in regional Queensland, Australia. The authors enrolled consecutive patients aged >65 years or older who presented with a suspected head injury by the treating clinician. All subjects included had a Glasgow Coma Scale (GCS) of 15 (or at baseline if underlying dementia) and were hemodynamically stable (defined as a combination of the absence of significant hemorrhage, poor organ perfusion, and hypotension by systolic blood pressure SBP). The primary outcome was the proportion of patients with ciTBI (defined as either a subdural hematoma, subarachnoid hemorrhage, epidural hematoma, or cerebral contusion which required medical or surgical intervention) within the 42 days of presentation. Follow-up was performed by electronic medical record review.

The investigators enrolled 276 patients meeting the inclusion criteria. The average age of subjects was approximately 80 years. 30% of patients had dementia and 52% were taking medications that increased the risk of bleeding. Roughly 25% of the patients lived in a care facility and the remainder lived independently. 80.8% of patients underwent head CT at the index ED visit and 3.3% had any intracranial hemorrhage. All patients who had an ICH arrived by ambulance and suffered injury from a fall. The incidence of ciTBI within 42 days of the initial ED visit was 2.5% (7 patients) and 71% of these patients were on an antiplatelet or anticoagulant agent. Six of 7 patients with ciTBI had external evidence of trauma above the clavicles (notable based on criteria in the New Orleans head CT rule). All patients with ciTBI either had external signs of head injury or new abnormalities on neurological examination. The most common mechanism of injury was a ground-level fall (93.8%) and all the ciTBIs in this study occurred in participants with ground-level falls. No patient with a ciTBI underwent neurosurgical intervention. Importantly, during the 42-day follow-up period, three patients died as a result of the TBI.

Editor's Comments: While this study does suggest that our clinical evaluation does, in fact, have utility in the risk stratification of older patients, including those with dementia and who are taking anticoagulants, this study was conducted

at a single site in Australia. While rare, ciTBI after minor head trauma still occurred in a small proportion of the older adults who appeared stable. This data is far from robust enough to change clinical policies from specialty societies regarding evaluation of head trauma in older adults. However, these findings do suggest the ongoing need to derive and validate a clinical decision rule specific to UC which could allow for more liberal criteria for clearance without CT. Until such a rule exists, it would be reasonable to cite this paper in instances of low clinical suspicion for ciTBI when a well-appearing, older patient is reluctant to go to the ED. The authors' findings provide some concrete figures which UC clinicians can reference for shared decision-making and informed refusal conversations. In such instances, it is critical to document and communicate clear indications for immediate ED evaluation with the patient and their family. ■

The Value of Cramming Prior to Performing Clinical Procedures – Is Just-In-Time Preparation the Ideal Strategy?

Take Home Point: In this study, a just-in-time training simulation intervention provided to inexperienced clinicians just prior to a high-stakes, rare procedure led to significantly higher rates of success when performing the actual procedure.

Citation: Flynn S, Park R, Jena A, et. al. Coaching Inexperienced Clinicians Before a High Stakes Medical Procedure: Randomized Clinical Trial. *BMJ*. 2024 Dec 16:387: e080924. doi: 10.1136/bmj-2024-080924.

Relevance: Depending on the practice setting, many acute care clinicians are faced with scenarios where an infrequently performed procedure is indicated. Preparation can be approached from a "just-in-time" (ie, reviewing procedure just before occasions when it will be performed) or "just-in-case" (ie, reviewing procedure regularly and being 'always ready'). As procedures in UC rarely need to be performed immediately, there is typically an opportunity for a "just-in-time" approach to procedure review. This study examines "just-in-time" coaching and simulation for such a scenario.

Study Summary: This was a single center, prospective, non-crossover, parallel group, non-blinded, randomized clinical trial conducted at Boston Children's Hospital, a large quaternary academic medical center in the United States. Participants were anesthesiology trainees from 10 regional training programs doing pediatric anesthesia rotation at the study facility. The authors block randomized participants to treatment or control groups before they performed endotracheal intubation of children aged ≤12 months. The control group had unstructured intraoperative instruction in intubation by attending pediatric anesthesiologists. The treatment group received a standardized coaching session and simulation using an infant manikin within one hour of the actual procedure.

For the study, 172 trainees were randomized (89 control, 83 treatment) and 515 intubations were included (283 control, 232 treatment) and analyzed. The authors found first attempt success for tracheal endointubation was higher in the treatment group than in the control group (91.4% vs 81.6%, odds ratio 2.42 (95% confidence interval [CI] 1.45 to 4.04), P=0.001. The number needed to treat (NNT) for the primary outcome was 10.2 (95% CI 6.4 to 25.2).

A secondary outcome assessed was the effect on the perceived cognitive load during the procedure between the intervention and control groups. Just-in-time training was associated with a significantly lower perceived cognitive task load while performing the procedure. Specifically, the control group participants reported higher frustration, time demands, and mental demands. Furthermore, the rate of complications was higher in the control group, but did not reach statistical significance (4.71% vs. 2.75%, P=0.22).

Editor's Comments: There are interesting findings from the study that may be useful to consider when training and upskilling UC clinicians. Specifically, it seems more valuable to ensure UC clinicians have access to immediately available educational and reference materials to review just before performing procedures. In some centers, even procedures like suturing lacerations may be performed infrequently. If this is true for the center where you practice or you have colleagues who feel uncomfortable with suturing, it would be worthwhile to have a practice suturing setup available on site so that clinicians who suture rarely might review the procedure and practice to build confidence before attempting the procedure on the patient. ■

Who's a Better Diagnostician– AI or Doctors?

Take Home Point: In this study, the use of large language model (LLM) did not enhance the diagnostic reasoning of physicians beyond the normal conventional resources that are available. However, the LLM alone (ie, without a clini-

cian in-the-loop) scored higher than physicians with or without LLM assistance.

Citation: Goh E, Gallo R, Hom J, et. al. Large Language Model Influence on Diagnostic Reasoning: A Randomized Clinical Trial. *JAMA Netw Open*. 2024 Oct 1;7(10):e2440969. doi: 10.1001/jamanetworkopen.2024.40969.

Relevance: LLM models are rapidly gaining adoption as a form of artificial intelligence (AI) in many domains. The question of the role of LLM use in medicine, and more specifically diagnostics, is a hotly debated topic. This study investigated accuracy of diagnostic reasoning among physicians in a simulated setting with and without the aid of the LLM.

Study Summary: This was a randomized single-blinded study with participants randomized to use the LLM interface (intervention group) or conventional resources (control group). The LLM used was a version of ChatGPT-4. Participants reviewed cases that were based on actual patients. They were provided with relevant clinical information such as history, physical examination findings, and test results. Each participant reviewed at least 50 of the 105 available cases. The cases were scored for correctness of diagnosis and next steps for patient evaluation and treatment.

"It is indeed a dramatic finding that ChatGPT alone outperformed clinicians. It is important to note, however, that this study used clinical vignettes."

Fifty physicians were enrolled. The participants were 26 attending physicians and 24 residents from a general medical specialty (ie, internal medicine, family medicine, or emergency medicine). In the study, 244 cases were completed by all participants (125 in LLM group, 119 in control group). The authors found that found that physician use of a the LLM chatbot did not improve diagnostic reasoning on challenging clinical cases. The diagnostic accuracy was 76% for the intervention group and 74% for the control group (P=0.60). The diagnostic accuracy of the LLM alone, however, significantly outperformed physician participants in both groups with a diagnostic accuracy rate of 92%

(P=0.03). The results were similar across subgroups of different training levels and experience with the chatbot.

Editor's Comments: This study has gained international attention among the lay press, and rightfully so. It is indeed a dramatic finding that ChatGPT alone outperformed clinicians. It is important to note, however, that this study used clinical vignettes. Although these were based on real patient presentations, it is unclear how such an LLM would perform without the structured input of relevant data. One of the most complex tasks for clinicians in diagnostic reasoning is understanding the requisite meaningful data to seek out and from what sources this data might be collected. This often comes mostly from patient interview, but it is not uncommon that additional data is required and collecting this data may require reviewing past medical records, conversations with other historians (eg, family members). Discerning what information is necessary, where to find it, and its reliability is a critical skill set for proficient diagnosticians. The vignettes in this study consisted of a neatly curated list of relevant data. All signal and no noise. This nuance is critically important, but unfortunately highly likely to be omitted when this study's results are discussed in the popular press or hospital board rooms. Without this context, it seems likely that those making decisions regarding clinician staffing and reimbursement will be inclined to undervalue the requisite detective work required to summarize a case–the necessary first step before an accurate diagnosis. ■

Heated Mittens for Hand Osteoarthritis

Take Home Point: The use of heated hand mittens did not positively affect hand function compared to standard, non-heated mittens in patients with osteoarthritis (OA).

Citation: Bartholdy C, Dossing A, Stisen Z, et. al. Effect of Heated Mittens On Physical Hand Function In People With Hand Osteoarthritis: Randomised Controlled Trial *BMJ*. 2024 Dec 17:387:e078222. doi: 10.1136/bmj-2023-078222.

Relevance: There has been a tradition of using heat therapy to provide symptomatic relief in the management of arthritis. This practice, however, has not been systematically investigated for effectiveness in any well-designed studies.

Study Summary: This was a randomized controlled trial investigating the effect of electronically heated mittens on improvement of hand function and pain in patients with OA of the hands. Participants were recruited from an OA outpatient clinic in Copenhagen, Denmark. Participants were randomized in a 1:1 ratio to receive battery heated mittens with heat applied to the dorsal aspect of the hands (intervention group) or identical mittens in which the wiring was disconnected (control group). Participants were asked to wear the mittens for 15 minutes daily for 6 weeks. The primary outcome was a change in hand function from baseline after the 6-week intervention period. Secondary outcomes were change in hand pain and overall subjective sense of OA affecting their lives.

A total of 200 participants were randomized and 186 completed the trial (91 in the intervention group and 95 in the control group). The average age of patients was 71 years and 87% of participants were women. The authors found both groups had some improvement in their hand function scores, but there was no significant difference in the improvement between groups (P=0.09). There were small and not statistically significant benefits in the intervention group for pain and stiffness scales, but no difference in the other outcomes investigated (grip strength, tender joint count, and swollen joint count).

Editor's Comments: While this study suggests there is no benefit to heated mittens, there are some caveats to this conclusion. First, this was a relatively small, single center study with ‹100 participants in each arm. The patients were not blinded to the treatment that they received. The scores that were recorded did not specify if they were for 1 or both hand function and other aspects investigated, which may influence the outcomes. Additionally, the patients only wore the mittens for 15 minutes per day. It is unclear if wearing the mittens longer or more frequently might have influenced the treatment effect. OA of the hands is a frequent and debilitating condition with limited treatment options. Unlike OA of the hip, knee, or shoulder, OA in the hands cannot be cured surgically. Given OA's chronic nature and lack of effective treatment options, safe, non-pharmacologic interventions, including heat therapy, warrant further investigation. Certainly, this study is insufficient evidence to dismiss these therapies in patients, especially for those who report that heat therapy is helpful. ■