CHEST

Practical Tips for ICU Bedside Teaching

Lekshmi Santhosh, MD; Wade Brown, MD; Juliana Ferreira, MD, PhD; Abesh Niroula, MD; and W. Graham Carlos, MD

CHEST 2018; 154(4):760-765

Excellent clinical teaching is a skill that can be studied, refined, and continuously improved, just as any other procedure. Teaching in the ICU comes with unique challenges given the medical complexity of the patients, the time pressure, the diverse levels and professions of learners, and the challenges of communication at the end of life. Trainees, clinician-educators, and junior faculty can particularly benefit from learning how to optimize teaching in the ICU because being a good ICU clinician does not automatically translate to being able to transmit the knowledge and skills effectively. Moreover, ICUs have the benefit of also being staffed by interdisciplinary team members and learners such as nurse practitioners and nurse practitioner students, as well as physician assistants and physician assistant students, in addition to medical students, residents, and fellows. In the present article, teaching tips transcend professional barriers: we use the term "learner" broadly to encompass all the aforementioned types of interdisciplinary learners. This article presents the latest evidence on ICU bedside teaching and incorporates practical tips and best practices for ICU teaching.

AFFILIATIONS: From the Department of Medicine (Dr Santhosh), University of California-San Francisco, San Francisco, CA; Department of Pulmonary and Critical Care Medicine (Dr Brown), Vanderbilt University, Nashville, TN; Divisao de Pneumologia (Dr Ferreira), Instituto do Coracao, Hospital das Clinicas HCFMUSP, Faculdade de Medicina, Universidade de São Paulo, São Paulo, Brazil; Albert Einstein Medical Center (Dr Niroula), Philadelphia, PA; and Division of Pulmonary, Allergy, Critical Care, and Occupational Medicine (Dr Carlos), Indiana University School of Medicine, Indianapolis, IN.

CORRESPONDENCE TO: Lekshmi Santhosh, MD, Division of Pulmonary & Critical Care Medicine, Department of Medicine, University of California-San Francisco, 505 Parnassus Ave, San Francisco, CA 94117; e-mail: Lekshmi.Santhosh@ucsf.edu

DOI: https://doi.org/10.1016/j.chest.2018.06.034

Teaching in the ICU Environment

Teaching in the ICU: From Behaviors to Boards to Barriers

Educators seeking to influence their learners want to know how to teach in the ICU and how to equip their learners for board certification. One multicenter survey study focused on what specific teaching behaviors internal medicine residents valued in ICU attendings. They found that residents valued attendings who enjoyed teaching, expressed empathy and compassion to patients and families, explained clinical reasoning and differential diagnoses, treated nonphysician staff members respectfully, and demonstrated enthusiasm on ICU rounds.

These teaching tactics can be refined and continuously improved, making them ideal for faculty development. Beyond behaviors that educators can learn, they also need to know the targets for board certification to prepare their learners. A multidisciplinary panel of critical care education experts in the American College of Critical Care Medicine established guidelines on the specific credentials (eg, Advanced Cardiac Life Support), cognitive skills (eg, management of shock and myocardial infarction), and procedural skills (eg, central line insertion) that critical care trainees should master. However, despite the comprehensive nature of this report in describing skills and diagnoses that trainees must master, little guidance was given on educational methods; the article broadly stated that critical care trainees should master these skills through "the use of any of a number of techniques, including didactic lectures, journal club sessions, and illustrative case reports."

A nationwide study of Pulmonary, Critical Care and Sleep Medicine fellowship program directors in the United States found that bedside teaching in the ICU was the most frequent teaching method combined with

TABLE 1] "One-Minute Preceptor" Rapid Teaching Model With an ICU Example of Hemoptysis

One-Minute Preceptor Framework	Teaching Script With ICU Case Example
Get a commitment from the learner	*"How do you approach hemoptysis?"*
Probe for supporting evidence	*"How do you know it's diffuse alveolar hemorrhage (DAH) in this case?"*
Teach general rules	*"DAH can actually present without hemoptysis."*
Reinforce correct behaviors	*"You are right that thrombocytopenia is a risk factor."*
Correct errors	*"But remember that the patient's platelet count is not low enough to be the sole explanation for hemoptysis in this case."*

informal case-based teaching sessions (91%) or didactic lectures (75%). Although bedside teaching was the most frequent teaching method used in the ICU, there is no clear standardized approach to critical care education.

However, there are barriers to consistent and effective bedside teaching in the ICU, related to both faculty and trainees. Faculty barriers include clinical workload and lack of protected time and funding, as well as the Accreditation Council for Graduate Medical Education regulations, which have consequences on resident continuity of care, attitudes, and availability for teaching. Interestingly, 63% of respondents believed that faculty had changed their approach to teaching in the ICU as a result of trainee duty hour restrictions.

In the face of these barriers, how can faculty and trainees maximize their teaching while in the busy ICU environment? The next sections focus on practical evidence-based tips and tricks to improve teaching in the ICU.

Teaching Under Time Pressure

The ICU clinical environment is extremely fast-paced, with the possibility of multiple patients decompensating at the same time; teaching, therefore, has to be time-efficient and high-yield. Previous studies have found that time pressures and high clinical workloads were the most significant barriers for faculty to change their teaching styles in the ICU. Fortunately, there is robust medical educational literature from the outpatient, ED, and inpatient settings discussing how to approach teaching in a time crunch.

Within minutes, the teacher can quickly assess the needs of individual learners by asking questions, selecting a model for rapid teaching such as the "1-minute preceptor" model, and providing quick constructive and corrective feedback on performance. This model was originally based on the five-step "microskills" framework for clinical teaching initially developed for outpatient clinic-based faculty precepting: it encourages teachers to get a commitment from the learner, probe for supporting evidence, teach general rules, reinforce correct behaviors, and correct errors. The 1-minute preceptor model and an ICU teaching example are shown in Table 1.

Mini-chalk talks are another useful method of quick, efficient bedside teaching that eschew lengthy PowerPoint presentations in favor of brief, visual, on-the-fly teaching moments (Table 2). On busy ICU rounds, preselecting which patients would be best for the focus of certain bedside teaching points is an effective and practical way to incorporate teaching in a time-efficient manner. Preselecting patients for high-yield teaching is frequently done in the outpatient setting, and

TABLE 2] Tips for Mini-Chalk Talks at the Bedside

■ Use case examples recently seen on-service to build up a "bank" of mini-chalk talk topics
■ Take time to practice and hone the talk in advance, but be flexible to accommodate learners' questions – purely ad lib talks can be unfocused
■ Use simple, high-yield figures, such as Venn diagrams, simple tables, flow charts, graphs, timelines, 2 × 2 tables, etc, instead of PowerPoint slides
■ Consider "gamification" of the teaching session to encourage participation (eg, set up a competition to see what team can assemble a thoracentesis kit accurately in the shortest amount of time)
■ Consider holding your mini-chalk talk outside of a traditional conference room (eg, at the bedside, outside the patient's room on rounds, etc)
■ Avoid the temptation to over-teach – multiple short high-yield teaching sessions about different aspects of the same talk may lead to better retention than one long PowerPoint presentation

this technique can be effectively applied in the ICU to save time and focus bedside teaching.

Teaching Tips for the Bedside and ICU Rounds

"Twelve tips to improve bedside teaching" is the title of a concise and comprehensive article that describes key strategies involved in bedside teaching prior to rounding, during rounds, and following rounds (Table 3). These twelve tips highlight intentional work to be done prior to, during, and following rounds to maximize the effectiveness of the bedside teaching encounter. Prior to rounds, the teacher needs to prepare for the session, plan the session, and orient learners to the session. During rounds, the teacher should introduce the team to the patient, model an ideal physician-patient interaction, observe trainees keenly, provide teaching points, and summarize learning points. Following rounds, the teacher is encouraged to build-in time for debriefing, feedback, and reflection, using these to prepare for the next session.

TABLE 3] Key Framework for Bedside Teaching From Ramani's "Twelve Tips to Improve Bedside Teaching"

Prior to rounds
1. *Preparation*: review the curriculum, know the teaching audience, improve their own subject knowledge, and consider further training in education
2. *Planning*: outline clear goals/expectations for the teaching encounter
3. *Orientation*: orient learners with session plan and goals/objectives for the session
During rounds
4. *Introduction*: Introduce team to patient and explicitly state that this moment is a teaching encounter
5. *Interaction*: Treat patient as a role model of an ideal physician-patient interaction
6. *Observation*: Keenly observe learners' interaction with the patient to learn more about modifying the session
7. *Instruction*: Engage the learner in the teachable moment and gently correct if errors are made
8. *Summarization*: Summarize teaching points from the encounter
Following rounds
9. *Debriefing*: Explicitly leave time to debrief outside the room to answer questions, raise more questions, assign readings
10. *Feedback*: Build-in time for feedback about the teaching encounter itself
11. *Reflection*: Personally reflect on what went well and what could be improved upon for next time
12. *Preparation*: Use insights from reflection to prepare and improve next session

The published literature on teaching techniques specific to the ICU is more limited. Given the time barriers we have previously discussed, ICU bedside teaching has to be deliberately and carefully refined. Educators should thoughtfully consider the limited scope of a bedside teaching session and resist the temptation to over-teach. Instead, giving a brief 5-min to 15-min talk at the bedside that is relevant to current or recently admitted ICU patients may be more helpful.

Carlos et al describe a useful framework to discuss how to incorporate ICU teaching in minimal time at the bedside: the CARE framework focuses on learning climate, attention to the teaching encounter, critical reasoning, and learner evaluation (Table 4).

Hayes et al specifically expand on teaching the "R" of the CARE framework, focusing on clinical reasoning in the ICU. They recommend explicitly teaching the cognitive science behind type 1 and type 2 systems of thinking, discussing cognitive biases and how to mitigate them, modeling and teaching inductive reasoning, using

TABLE 4] Features of the CARE Framework From Carlos et al ("Teaching at the Bedside: Maximal Impact in Minimal Time")

Climate (C)
Set learner expectations and be explicit regarding observation
Avoid medical jargon and one-upmanship
Explain purpose of encounter and encourage participation
Set patient expectations and ask permission
Attention (A)
Plan encounter in advance
Remain focused in the moment
Keep content relevant for all learners
Maintain democratic leadership style
Reasoning (R)
Encourage hypothesis-driven examination
Ask probing questions
Avoid "read-my-mind: questions
Give formative feedback focused on behaviors
Evaluation (E)
Avoid pointed criticism
Encourage reflection after the encounter
Compile observations for summative feedback

TABLE 5] Critical Components of Crew Resource Management With Skills and Examples

Situational awareness: Active involvement of all team members to visualize and acknowledge the field • Skill: Closed-loop communication helps incorporate the perspectives of all team members and allows verbal "teach-back" of actions • Example: Physician: *"Let's set a goal for this patient to get out of bed today."* Physical Therapist: *"Agreed, I'll make it a goal to at least mobilize the patient out of bed to chair once today."* Physician: *"Yes, thank you for clarifying."*
Problem identification: Use of voluntary, active, and open communication to declare concerns. • Skill: Shared mental models help ensure all team members are on the same page about the problem • Example: *"At this point, I'd like to summarize where we are with this patient and get your feedback and perspectives before we talk to the family again."*
Decision-making: Generation of alternative acceptable solutions through accurate anticipation and diagnosis of problems. • Skill: Inviting consensus helps rely on the expertise of multiple team members to ensure that diverse opinions are considered to avoid premature closure • Example: *"Team, I'd like each one of you to weigh in on whether or not the patient is ready for extubation."*
Workload distribution: Assignment of tasks so that no team member is overloaded. • Skill: Intentional delegation and communication of who performs specific tasks • Example: *"As our ICU Team Pharmacist, could you please look up whether the new antibiotic could be associated with the abnormal liver function tests?"*

questions to stimulate critical thinking, and providing feedback on critical thinking.

The CARE framework and the critical reasoning strategies provide learner-focused practical tips for ICU trainees and faculty alike to incorporate into ICU bedside teaching.

Teaching ICU Knowledge and Skills

Teaching Team Management

The ICU team is diverse and interdisciplinary. It may include various professionals such as pharmacy, nursing, and respiratory therapy, as well as differing learner levels from students to fellows. Lessons in communication have been learned from the airline industry. The aviation Crew Resource Management curriculum promotes cooperation and coordination of skills that parallels health care models (Table 5). This model has been increasingly used in the quality improvement literature in health care, but it has been explored in less detail in medical education (outside of the simulation literature).

Key components to effective bedside teaching with a team include orienting all involved to roles, responsibilities, and expectations. Open communication should be encouraged, and educators should strive to create a learning environment that is safe and fosters inquisitive discussion and critical thinking. Finally, interprofessional education can occur outside the hospital as well. Several courses that include simulation have been developed to train teams together. Ensuring psychological safety of all interprofessional team members is critical to ensure high-performing teams, especially during high-stakes situations such as resuscitations and codes.

Teaching Patient and Family Communication Skills in the ICU

The literature on bedside teaching in the ICU has often focused on the transmission of medical knowledge, but ICU teaching is also particularly unique for its focus on communication, particularly at the end of life. Teaching about communication, specifically in the context of family meetings in the ICU, is another invaluable skill for trainees and a teaching opportunity for faculty and fellows. Miller et al argue that communication in the ICU should be taught similarly to invasive procedures (eg, central line insertions) by focusing on training, observation, and feedback on communication skills to

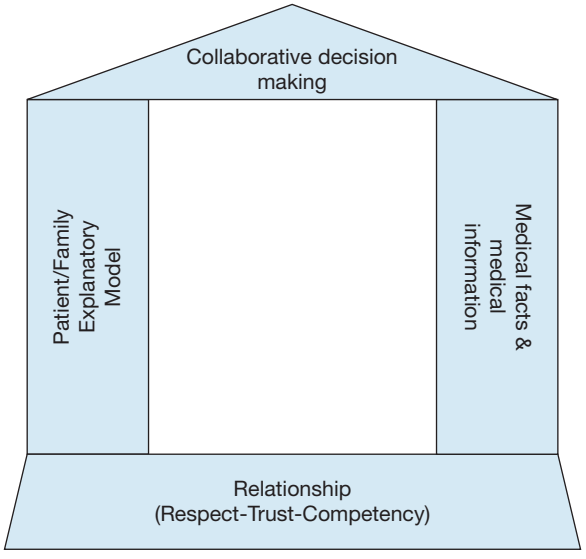

Figure 1 – *Communication in family meetings in the "house" model outlined by Bhang and Iregui. Figure adapted from Bhang TN, Iregui JC. Creating a climate for healing: a visual model for goals of care discussions. J Palliat Med. 2013;16(7):718-718.*

TABLE 6] Six-Step Framework for Procedural Skills Teaching

1. Learn: Learn about the procedure via reading or videos. Example: "*Please review the New England Journal of Medicine video on thoracentesis before this afternoon's procedure.*"
2. See: Instructor demonstrates the skill, first nonverbally, then going through the individual steps with verbal description. Example: "*First I'm going to show you how to do the thoracentesis on the mannequin simulator, then I'm going to show you again, this time, talking you through each step.*"
3. Practice: Deliberate practice on simulator Example: "*For this next step, I'd like you to really focus on keeping the needle perpendicular to the patient's body.*"
4. Prove: Summative assessment and feedback on simulator Example: "*Now I'm going to watch you do an entire thoracentesis on the mannequin simulator and give you feedback afterwards.*"
5. Do: Direct supervision of performance on human Example: "*I'm going to directly supervise you doing your first thoracentesis on the patient.*"
6. Maintain: Maintenance of skill through clinical practice supplemented by simulation as needed Example: "*It's been over a year since your last thoracentesis, so let's return to the simulation lab to refresh ourselves quickly.*"

Adapted from Sawyer et al. Learn, see, practice, prove, do, maintain: an evidence-based pedagogical framework for procedural skill training in medicine. *Acad Med*. 2015;90(8):1025-1033.

achieve mastery. Some training programs have adopted required communication training during ICU rotations and have found improvement in residents' perceived skills and positive family member responses. Bhang and Iregui recommend that family meetings be structured on the foundation of a relationship of trust, framed by the patient and family explanatory models as well as the medical facts, and supported by collaborative decision-making (Fig 1).

Hinkle et al provide a series of tips focusing on communication skills for difficult conversations in a clinical situation, which are particularly applicable to the ICU setting. They recommend assessing the learners' baseline communication skills as well as their understanding of the clinical situation and then matching the learners' educational needs with their assigned roles in the difficult conversation. Prior to a family meeting, the meeting agenda should be reviewed with the learner; the instructor should prepare for the meeting by discussing the learner's individual goals and reviewing pertinent communication skills ahead of time. Once in the meeting itself, the patient and family should be informed that the trainee will lead the meeting, and the instructor should actively observe and take notes during the encounter. It is important to avoid interruptions yet be prepared to step in if needed. Following the encounter, the learner should be debriefed, providing opportunities for reflection and corrective feedback, while making an action plan for the future.

Teaching Procedural Skills

Teaching procedures in the ICU is also an important part of the educational experience. A six-step framework for teaching of procedural skills can help the instructors best communicate the information (Table 6). First, learners have to acquire the cognitive knowledge about the procedure through learning about it in didactic lectures and observing the procedure itself. The learner then ideally should practice the procedure using simulation and prove competency prior to performing the procedure on a patient. The learner then graduates to performing the procedure on the patient while being observed by the teacher. Continuing practice helps maintain these skills. This "learn, see, practice, prove, do, maintain" framework is easy to implement even in the busy ICU and goes beyond the simple "see one, do one, teach one" model.

Conclusions

ICU bedside teaching is a formative experience for physicians and professionals. The ICU environment is conducive to teaching critical thinking skills and demonstrating key communication skills such as empathy. For bedside teaching to remain valuable, we encourage educators to pay attention to details throughout the rounding process (prior to, during, and following rounds). Educators frequently perceive that time is the biggest barrier to ICU teaching; we therefore have highlighted tactics for teaching "on the fly" that are high value, such as the 1-minute preceptor and use of mini-lectures. In the ICU specifically, the CARE teaching framework focuses on learning climate, attention to the teaching encounter, critical reasoning, and learner evaluation. These proven successful strategies will hopefully inspire instructors to practice continuous quality improvement of their teaching skills.

Acknowledgments

Financial/nonfinancial disclosures: None declared.

Suggested Readings

Neher JO, Gordon KC, Meyer B, Stevens N. A five-step "microskills" model of clinical teaching. *J Am Board Family Prac*. 1992;5(4):419-424.

Armani S. Twelve tips to improve bedside teaching. *Med Teach*. 2003;25(2):112-115.

Augarde E, Teheran A, Irby DM. Effectiveness of the one-minute preceptor model for diagnosing the patient and the learner: proof of concept. *Acad Med*. 2004;79(1):42-49.

Dorman T, Angood PB, Angus DC, et al; American College of Critical Care Medicine. Guidelines for critical care medicine training and continuing medical education. *Crit Care Med*. 2004;32(1):263-272.

Flanagan B, Nestel D, Joseph M. Making patient safety the focus: crisis resource management in the undergraduate curriculum. *Med Educ*. 2004;38(1):56-66.

Irby DM, Bowen JL. Time-efficient strategies for learning and performance. *Clinical Teacher*. 2004;1(1):23-28.

Oriol MD. Crew resource management: applications in healthcare organizations. *JONA*. 2006;36(9):402-406.

Irby DM, Wilkerson L. Teaching when time is limited. *BMJ*. 2008;336(7640):384-387.

Chudgar SM, Cox CE, Que LG, Andolsek K, Knudsen NW, Clay AS. Current teaching and evaluation methods in critical care medicine: has the Accreditation Council for Graduate Medical Education affected how we practice and teach in the intensive care unit? *Crit Care Med*. 2009;37(1):49-60.

Almoosa KF, Goldenhar LM, Puchalski J, Ying J, Panos RJ. Critical care education during internal medicine residency: a national survey. *J Grad Med Educ*. 2010;2(4):555-561.

Manthous C, Nembhard IM, Hollingshead AB. Building effective critical care teams. *Crit Care*. 2011;15(4):307.

Bhang TN, Iregui JC. Creating a climate for healing: a visual model for goals of care discussions. *J Palliat Med*. 2013;16(7). 718-718.

Sawyer T, White M, Zaveri P, et al. Learn, see, practice, prove, do, maintain: an evidence-based pedagogical framework for procedural skill training in medicine. *Acad Med*. 2015;90(8):1025-1033.

Carlos WG, Kritek PA, Clay AS, Luks AM, Thomson CC. Teaching at the bedside. Maximal impact in minimal time. *Ann Am Thorac Soc*. 2016;13(4):545-548.

Miller DC, McSparron JI, Clardy PF, Sullivan AM, Hayes MM. Improving resident communication in the intensive care Unit. The proceduralization of physician communication with patients and their surrogates. *Ann Am Thorac Soc*. 2016;13(9):1624-1628.

Sullivan AM, Rock LK, Gadmer NM, Norwich DE, Schwartzstein RM. The impact of resident training on communication with families in the intensive care unit. Resident and family outcomes. *Ann Am Thorac Soc*. 2016;13(4):512-521.

Hayes MM, Chatterjee S, Schwartzstein RM. Critical thinking in critical care: five strategies to improve teaching and learning in the intensive care unit. *Ann Am Thorac Soc*. 2017;14(4):569-575.

Hinkle LJ, Fettig LP, Carlos WG, Bosslet G. Twelve tips for just in time teaching of communication skills for difficult conversations in the clinical setting. *Med Teach*. 2017;39(9):920-925.

Pitt MB, Orlander JD. Bringing mini-chalk talks to the bedside to enhance clinical teaching. *Med Educ Online*. 2017;22(1).

Santhosh L, Jain S, Brady A, Sharp M, Carlos WG. Intensive care unit educators: a multicenter evaluation of behaviors residents value in attending physicians. *Ann Am Thorac Soc*. 2017;14(4):513-516.