INNOVATING EMERGENCY NURSING TOOLS AND TECHNOLOGY: WORK DESIGN FOR QUALITY AND PATIENT SAFETY

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“We can choose a technological solution to the profound humane disconnection that exists today in healthcare; a more humane medicine, enabled by machine support, can be the path forward.”

In the book *Deep Medicine, How Artificial Intelligence Can Make Healthcare Human Again*, author Eric Topol delivers a futuristic glimpse of the optimistic possibilities that artificial intelligence technology might add to everyday healthcare practice. Synthesizing research studies and case examples for a lay audience, the book presents a compelling argument that the next generation of health care, supported by artificial intelligence, will seamlessly integrate genetic, wearable sensor, medical record, and social media data sources to optimize and personalize diagnostic accuracy, clinician workflow, and patient education and health coaching. New tools and technology enable care decisions to be made remotely, which means components of future care may be provided entirely separate from traditional, physical emergency department spaces. Unfortunately, realizing the full promise of the next generation of tools and technologies can easily be derailed by failing to adequately integrate ethical decision-making and urgent clinical priorities, overlooking programming bias, neglecting data security and privacy problems, and failing to structure decision-making transparency (especially if this decision-making lacks nursing representation).

Tools and technologies are “the objects that people use to do work or that assist people in doing work.” Emergency care work systems are dependent on multiple tools and technologies. This issue of the *Journal of Emergency Nursing (JEN)* features tools and technologies for emergency care. Publications in this issue test, develop, review, and discuss these pertinent tools and technologies. Two randomized control trials of devices are included in this issue: Buzzy and Shotblocker distraction devices to reduce pediatric pain and fear from intramuscular injections and a novel funnel urine collection system with silver-colloidal cleaning wipe to reduce midstream clean-catch urine contamination. Low fidelity simulation as a professional development education tool was also tested in a single group pre-test, post-test design. Three studies focus on tools and technologies for patient education in this issue, which are essential innovations to address patient health literacy and health disparity in the current wave of technology proliferation. Winokur, Rutledge, and McGowen developed innovative picture-based discharge instruction tools in response to the low health literacy findings of their descriptive study. Likewise, several educational hand-out tools with simple illustrations for urine specimen collection, used in the Lough and colleagues study, have been reprinted in this issue for JEN readers. Sheele and colleagues tested patient preferences for education instructions delivered using low-tech written handouts and video technology. One study included in this issue of JEN, by Favot and colleagues, used a chart review design focused on ultrasound technology to guide the insertion of peripheral intravenous catheters. Commentary published in this issue of JEN includes recommendations for several types of weight scales to improve the safety of weight-based medication calculations and recommendations on the size and length of needles used for decompression in tension pneumothorax. This technology-rich issue of JEN is timely and coincides with the 2019 Emergency Nurses Association’s annual conference in Austin, Texas. Austin is also home to a National Institutes of Health, National Institutes...
of Nursing Research Center Core Grant (P30) recipient, the University of Texas Austin, leading innovative methods and technology care.17

How do we ensure new tools and technology actually contribute to improved care, rather than act as a “cool new toy” or replacement for other essential components of the emergency health care system?3 New tools and technologies alone may not improve patient, emergency nursing workforce, or emergency department outcomes. As depicted in the Figure, the Systems Engineering Initiative for Patient Safety (SEIPS) model 2.0 provides an important framework and systems thinking perspective to tie these tools and technologies into the overall contribution to emergency nursing job design for quality and patient safety outcomes.6 Using this mental model, the emergency nursing work system is composed of six interacting components, of which the tools and technologies category is only one component (Table). The remaining five work system components are person, tasks, organization, internal environment, and external environment. See the Table for brief examples of each component. The theory posits that all six of these components must be adequately balanced in the job design to positively impact patient outcomes, professional emergency nursing outcomes (e.g., reduced burnout), and improved organizational metrics. This balance in job design likely comes as no surprise to emergency nurses, who may have experienced the introduction of new technology with the reduction of staffing. Another example of failing to positively balance job design is the introduction of technology that increases, rather than decreases, the number and complexity of tasks. A third example is the introduction of technology without consideration for the patient or professional competencies needed to adequately utilize the novel device. Alternatively, an emergency care team with excellent competency, preparation, and teamwork cannot perform their jobs optimally with outdated and fragile equipment. Overall, the emergency nursing work design must include excellent support and commitment to innovative improvements in all six areas of the work system for optimal job performance, patient health, patient safety, and quality of nursing working life. At JEN, we look forward to publishing continued innovations and achievements to inform all components of the ideal job design of the emergency nurse.
REFERENCEs


### TABLE

<table>
<thead>
<tr>
<th>Component</th>
<th>Example</th>
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<tbody>
<tr>
<td>Person</td>
<td>Patient health literacy level; emergency nurse competency</td>
</tr>
<tr>
<td>Organization</td>
<td>Policy and procedures; safety culture; rewards for patient satisfaction; incentives for quality metric achievements</td>
</tr>
<tr>
<td>Technology and tools</td>
<td>Electronic whiteboards depicting patient diagnoses and treatment bay; usability of a new ultrasound device; patient monitor; stretcher</td>
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<tr>
<td>Tasks</td>
<td>Inserting peripheral intravenous line; patient assessment; nurse-initiated triage protocols; phlebotomy; medication administration</td>
</tr>
<tr>
<td>Internal environment</td>
<td>Distance from work station to patient room; positioning of security personnel workstation relative to treatment bays; lighting and noise levels</td>
</tr>
<tr>
<td>External environment</td>
<td>EMTALA regulation and enforcement; third party payer reimbursement changes; weather extreme events or disaster; availability of primary and preventive care</td>
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Note: EMTALA = Emergency Medical Treatment & Labor Act.