



## Featured Article

# Innovations in Simulation: Nursing Leaders' Exchange of Best Practices

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## KEYWORDS

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teamwork

**Abstract:** Fifteen simulation specialists met at Columbia University School of Nursing on October 12, 2018, for an interprofessional summit on innovations in simulation. Three successive panels focused on the future of simulation-based education, latest trends in simulation research, and linking simulation to improved patient safety outcomes. Discussions following each panel presentation generated many forward-thinking recommendations. In addition to summarizing those recommendations, this article reviews the evolution of simulation and explores steps that can take it to the next level for students, educators, researchers, and practicing clinicians, with the goal of improving patient outcomes.

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Simulation has long been used as a training modality in industries other than health care (e.g., military, aviation) (Aebersold, 2016). In the health care arena, medicine was first to adopt simulation, but nursing has rapidly embraced simulation in recent years. Most nursing schools now substitute simulation-based education for clinical hours

(Breymer et al., 2015). Although few schools of nursing had manikins as recently as 2,000, now nearly all do, and virtual simulation is already used by two-thirds of nursing education programs (Forneris & Tiffany, 2017).

The explosive adoption of simulation in the health care environment has led to inconsistent implementation of this valuable learning modality. For example, although some

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nursing schools have created excellent programs and are finding new ways to benefit from simulation, others struggle to use simulation optimally despite years of experience, and others are still fairly new to simulation.

To exchange ideas, discuss innovations, and make recommendations

for advancing the use of simulation in ways relevant for twenty-first century health care professionals, 15 simulation specialists met at Columbia University School of Nursing in October 2018, for the inaugural *Innovations in Simulation Summit: An interprofessional exchange of best practices in clinical education* (see [Appendix](#) for the list of attendees, page 14). The simulation experts were selected based on their established reputation for their research in simulation, publications, and leadership roles in simulation organizations. The conference featured national and international presenters from various backgrounds including simulation center directors, deans of universities, faculty, and physicians who all have a significant background in simulation-based education. Having a diverse panel of presenters from various clinical settings and regions of the world provided different perspectives on the current best practices in simulation and the future of simulation. The summit and this proceedings paper were supported by a donation from the Helene Fuld Health Trust. A second summit is being planned for late 2019; the donation supports a total

### Key Points

- Simulation has evolved to be a major aspect of undergraduate and graduate education in health care and is also beneficial for practicing professionals, both individually and in interprofessional teams.
- Anyone wanting to develop and provide simulations should follow the guidelines and standards of professional organizations to assure that their programs will achieve their goals. Essential elements include trained personnel who design and conduct simulations as well as support of the administration.
- Research has demonstrated that learners benefit from simulated experiences before encountering similar events with real patients. Now research needs to focus on clinical benefits, such as improved patient safety.

of five annual summits.

## Recommendations From The Summit

The summit was organized around three main topics: the future of simulation-based education, latest trends in

simulation research, and linking simulation to improved patient safety outcomes. The authors of this paper served as conference organizer (Kellie Bryant) and panel moderators (Michelle Aebersold, Pamela Jeffries, Suzan Kardong-Edgren). They led discussions among the summit attendees which, along with a literature review, are the basis for this report.

### Panel: Future of Simulation-Based Education

Moderator one reviewed trends in simulation-based education, including increased regulation and standards, simulation in graduate nursing education, and introduction of new modalities such as artificial intelligence. She and the panelists emphasized that the goal of simulation-based education is not to introduce the latest technology into training but to develop practice-ready professionals. They also emphasized the importance of integrating simulation into the curriculum; developing faculty to lead experiential learning; encouraging students to hone their clinical decision-making skills; increasing portability, with more simulations offered on smart phones and tablets; and interprofessional teamwork training. The ensuing discussion among the summit attendees generated nine recommendations for driving simulation-based education forward ([Table 1](#)).

### Panel: Latest Trends in Simulation Research

Moderator two provided an overview of simulation research, including reporting guidelines and important areas for research. Panelists added suggestions for the future research agenda and noted best practices for documenting and reporting research. They emphasized the need for research on how well simulation-based education prepares students for the transfer into clinical practice. This research is often challenging because of time constraints and different priorities in the clinical setting. Recommendations for improving simulation research are provided in [Table 2](#).

### Panel: Linking Simulation to Improved Patient Safety Outcomes

Moderator three noted the current trends, simulation needs for academia and practice, and gaps in our current simulation practices as it relates to patient safety. Panelists stressed the importance of human factors, including the effects on both simulation participants and health care providers in the clinical setting. Panelists also talked about creative ways to design and evaluate simulation scenarios and the need to consider the sequencing of training on clinical decision-making. Recommendations for linking simulation to patient safety outcomes are provided in [Table 3](#).

**Table 1** Recommendations for Driving Simulation-Based Education Forward

1. As schools continue to replace clinical hours with simulation, they need to develop integrated, sustainable, simulation-based curricula for both undergraduate and graduate competency-based education.
2. Simulation must evolve from teaching stand-alone skills and focus on training for the good clinical judgment that underlies delivery of quality medical care. Skills acquisition should be viewed as just one option among many for simulation scenarios.
3. Simulation scenarios focused on skill building needed to be repeated more than once, provided the schedule allows. This deliberate practice model is useful when trying to ensure competency in skill acquisition. Students often need more than one "dose" of simulation to meet learning outcomes.
4. Simulation scenarios should be built around patient needs and promote patient safety.
5. All members of the health care team should participate in simulation-based education, preferably in sessions with members of other disciplines. All need training to become facilitators who can create a safe environment for simulation-based education.
6. Faculty should engage proactively with new immersive technologies, such as virtual and augmented reality, that will foster learning in the digital age. A long-range goal is to explore how simulation, especially simulation with these newer technologies, can help evaluate competency.
7. Nursing schools should explore partnerships with hospitals and other groups that might result in better funding. Simulation education can be positioned as an essential tool in safe transitioning from the educational setting into clinical nursing.
8. Demonstration projects and multisite studies are needed to provide evidence that what is currently done as the "gold standard" for clinical education is working.
9. More evidence of the value of simulation in graduate clinical education is needed. Simulation may be an ideal method not only for nurse practitioner education but also for assessing advance practice nursing competencies ([Association of American Colleges of Nursing, 2017](#)).

Recommendations from the inaugural Innovations in Simulation Summit: An interprofessional exchange of best practices in clinical education held at Columbia University School of Nursing on October 12, 2018.

## Evolution of Simulation

In addition to generating the forward-looking recommendations detailed previously, the day-long summit included robust discussion about the evolution of simulation and how simulation informs its future. Simulation was described by some as "in its infancy," whereas others argued it was further along. All agreed that simulation is essential to improving educational and clinical outcomes and that it has evolved greatly. This evolution is important to review, not just to appreciate how far the

**Table 2** Recommendations for Improving Simulation Research

1. To help focus research efforts, simulation organizations, such as the Society for Simulation in Healthcare and the International Nursing Association for Clinical Simulation and Learning, should collaborate to establish a shared research agenda of three or four priorities.
2. To build research experience and capacity, independent nursing researchers should participate in Agency for Healthcare Research and Quality studies along with physicians and nurses at large medical centers attached to schools.
3. Simulation research needs to be more rigorous, with minimum standards across studies.
4. Guidelines for reporting on and assessing the quality of simulation research have been suggested and validated ([Cheng et al., 2018](#)). These rubrics can guide the design of studies, which should lead to better quality research ([Fey, Gloe, & Mariani, 2015](#)).
5. All studies need a theoretical framework. The National League for Nursing (NLN) Jeffries Simulation Theory provides a conceptual framework for understanding the elements of simulation and their relationships to each other ([Jeffries, Rodgers, & Adamson, 2015b](#)).
6. Studies should enroll larger numbers of subjects, perhaps by making more studies multisite.
7. Longitudinal studies are needed to develop evidence about long-term retention of knowledge, transfer of learning to the clinical setting, and the impact of simulation on improved patient outcomes.
8. Partnerships with researchers outside of the simulation field, such as systems engineers, patient safety officers, aviation safety specialists, computer science and informatics specialists, and human factor engineers, should be explored to make simulation studies more robust.
9. Because education research is poorly funded in general, simulation education studies should be connected into stronger funding streams. For example, partnerships could be explored with virtual and augmented reality companies, whose technology may be the future of simulation.
10. There is much to learn and study in the area of simulation pedagogy. Simulation researchers should review existing literature thoroughly before designing a study to be sure their study is new and significant to the field.
11. Authors should make their published work available and accessible to those who would benefit from reading it, such as dissertation advisors, health care administrators, and patient safety officers.
12. When publishing, researchers need to include detailed information in abstracts. This serves several purposes: others may be prompted to read the paper, and it will be properly indexed for identification and inclusion in systematic, integrative reviews.
13. Simulation researchers need to build time for mentoring others into their weekly routines.

Recommendations from the inaugural Innovations in Simulation Summit: An interprofessional exchange of best practices in clinical education held at Columbia University School of Nursing on October 12, 2018.

**Table 3** Recommendations for Linking Simulation to Patient Safety Outcomes

1. Although experiential learning such as simulation is difficult to evaluate (Adamson & Kardong-Edgren, 2012; Aebersold, 2016; Alexander et al., 2015), it is imperative to find ways to evaluate it to be certain that it is achieving the desired goals, including improved patient safety.
2. It is important to recognize and limit biases in how simulation scenarios are structured and to study the effect on patient safety of various teaching patterns, such as the order in which subjects are taught.
3. Debriefing should also be used in clinical practice; for example, debriefing can be helpful after sentinel or near miss events in the hospital setting.
4. Hospital administrators (C-suite) need to be involved in discussions about simulation and its impact on outcomes. Simulation specialists should learn the priorities of administrators, which may be different from their own.
5. Simulation evaluation must move beyond its educational value and include the impact on patient safety as an important return on investment.
6. Simulation scenarios that include internal error reporting and difficult discussions with families about medical errors are likely to encourage better reporting and more transparency in the clinical setting. Examples from other industries (e.g., nuclear power plants) that incentivize error reporting to create a culture of safety might inform scenario development.

Recommendations from the inaugural Innovations in Simulation Summit: An interprofessional exchange of best practices in clinical education held at Columbia University School of Nursing on October 12, 2018.

field has come, but as a jumping-off point for the ongoing progress.

Some ways that simulation is evolving include the following:

- Simulation began as a way to teach technical skills but is now recognized as a way to practice affective domain skills such as empathy and the development of critical thinking skills to prepare students for delivering safe care.
- Simulation scenarios are shifting more toward what students must learn rather than what faculty need to teach with a goal of creating simulations that reflect actual practice, including interprofessional teamwork.
- Initially seen as an educational method for undergraduates, simulation is now being used effectively for graduate health professionals. Simulation can even play a role in training nonprofessionals, such as family members, to develop confidence in at-home care of loved ones.
- Informal on-the-job training for simulation faculty is gradually being supplemented with formal simulation training and conferences. Training of faculty conducting simulations is critical. Simulation educators understand the goals and the importance of creating supportive environments in the prebriefing and debriefing periods.

- Based on early experience with simulation, professional organizations have developed guidelines to help those creating simulation programs.

## The Purposes of Simulation Have Expanded

In the educational setting, the goal of simulation is to prepare students for safe transition into practice, that is, to develop practice-ready professionals. Deliberate practice affords learners the opportunity to participate in recurring simulations to perfect their skills. For example, with just six minutes of monthly practice with a manikin that provides automated feedback, nursing students were able to improve and maintain their cardiopulmonary resuscitation skills over the course of a year, whereas a control group that did not engage in deliberate practice showed declining skills (Oermann, Kardong-Edgren, & Odom-Maryon, 2011).

However, today's simulation goes beyond task training. The tasks in simulations are embedded in experiential learning. During the debriefing phase of simulation, the facilitator guides participants to understand what happened during the experience and to reflect on what could be done to improve the situation. This deliberate practice of reflection and critical thinking is what sets simulation apart from simple task training.

## Scenarios Improve With Experience

As more faculty become experienced in simulation, scenarios focus on what students must learn rather than what faculty needs to teach. The best scenarios are likely to be developed by a small, multidisciplinary group that includes educators, subject matter experts, and simulation experts. Scenarios need to be realistic. Summit attendees noted a common failure with scenarios: students know something will go wrong that will require their decisive action. This does not reflect most clinical care; in fact, most patient encounters go smoothly. Not all simulation scenarios should be complicated; some should reflect a typical day of practice.

Although scenarios have improved, most still involve one or several students working with a single simulated patient. Although that may be useful to teach skills, summit attendees noted that it does not reflect clinical reality, where a professional works simultaneously with multiple patients. A school of nursing in Boise, Idaho, created a more realistic simulation scenario; it included several patients with diverse conditions and needs, a collaborative setting, and multiple tasks, including working with electronic health records, prioritization, and delegation (Josephsen & Butt, 2014). Nursing students who would be graduating soon participated in the pilot project, in which they viewed a video and identified quality and safety competencies. Although students identified important nursing task-based skills, they failed to note delegation, prioritization, or

working together collaboratively. The results suggest challenges for designing scenarios that prepare students for working in today's complex health care environment.

There is growing recognition that nontechnical skills can also be practiced through simulation. For example, in a scenario in which a patient disclosed that she was being abused by a family member, students had an opportunity to practice mandatory notification and involvement of social services. Although the students felt uncomfortable with the scenario, they were glad to have had the experience before encountering it with a real patient (Kardong-Edgren, Starkweather, & Ward, 2008). Empathy and communication with patients and family are additional essential nontechnical skills that may be practiced through simulation.

### There Is Growing Recognition That Prebriefing and Debriefing Are Essential

Much more has been written about debriefing than prebriefing. The latter is the orientation that takes place immediately before the simulation and sets the tone and culture of the simulation encounter. Prebriefing serves several functions: it establishes trust, so participants feel safe; it outlines expectations and it provides orientation to the environment and equipment, roles to be assumed during the scenario, and method of evaluation (INACSL Standards Committee, 2016a). The simulation educator or facilitator plays an essential role in preparing students for a simulation (McDermott, 2016).

As important as the simulation scenario is for developing and honing skills, summit participants stressed that it is during debriefing immediately after the scenario that knowledge truly increases (Shinnick, Woo, Horwich, & Steadman, 2011). They discussed how debriefing will likely change as new technology is adopted in simulation. For example, virtual gaming simulation offers feedback during the experience, allowing the gamer to move on to the next step or level after completing a task appropriately. In a large study with 200 participants, Verkuyl et al. (2018) found this feedback served as adequate debriefing for this form of simulation.

### Simulation as an Educational Modality

Summit participants discussed how simulation can and should be an educational disruptor. As simulation is being integrated into curricula, educators are exploring how simulation can replace certain aspects of the nursing curriculum. Simulation has also challenged the traditional "see one, do one, teach one" model, which exposes patients to harm because it requires health care professionals and those in training to care for patients with limited supervision from more experienced professionals (Rodriguez-Paz et al., 2009). The simulation model is "see one, practice, practice, practice, do one, and then teach." Bringing simulation into the curriculum, delivering content experientially, encouraging deliberate practice, and helping students

understand and reflect on their experience—this is a great evolution in nursing education.

### Audiences for Simulated Learning Are Expanding

Participants in simulation are not just undergraduates; advance practice nurses and other practicing professionals also engage in simulation. In addition to teaching new skills, simulation also can be useful to correct suboptimal patterns of practice. For example, after simulation that included deliberate practice with instructor feedback, scores improved significantly on all central line maintenance tasks among nurses with many years of experience in intensive care (Barsuk et al., 2015).

Another example is the use of a virtual reality game as a refresher for sterile urinary catheterization skills (Kardong-Edgren, Breikreuz, Werb, Foreman, & Ellertson, 2018). Simulation is also an excellent refresher for skills that are important to know but rarely used, such as cardiopulmonary resuscitation (Oermann et al., 2011; Oermann, Kardong-Edgren, & Odom-Maryon, 2012). Summit participants recognized that approaches like gaming and virtual reality may have little appeal to some people in charge of educating the students of today and tomorrow, whereas students who grew up in the digital age may become more involved in these exercises, engage more eagerly in deliberate practice, and enjoy learning this way (Butt, Kardong-Edgren, & Ellertson, 2018; Kardong-Edgren et al., 2008; Starkweather & Kardong-Edgren, 2008).

In today's health care environment, care often takes place in the outpatient and in-home setting. Family members can be brought into a simulation center to practice caring for their loved one's dressings, chest tubes, central lines, and other challenges that can overwhelm people without training in health care. An extra benefit of this approach is that it raises community awareness and support for simulation.

### Guidelines Direct Incorporation of Simulation Into the Curriculum

A National Council of State Boards of Nursing study (Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries,

**Table 4** Five Key Components of Successful Simulation Programs

1. Leadership commitment.
2. Dedicated and appropriate facilities (i.e., physical space).
3. Appropriate educational and technological resources and equipment.
4. Qualified simulation lab personnel and faculty who are prepared to lead simulations.
5. Firm understanding of policies and processes that are part of the simulation experience.

Adapted from Alexander et al. (2015). NCSBN simulation guidelines for prelicensure nursing programs. *Journal of Nursing Regulation*. 6(3), 39-42.

**Table 5** Essential Elements of Simulation Design

1. Perform a needs assessment to provide the foundational evidence of the need for a well-designed simulation-based experience.
2. Construct measurable objectives.
3. Structure the format of a simulation based on the purpose, theory, and modality for the simulation-based experience.
4. Design a scenario or case to provide the context for the simulation-based experience.
5. Use various types of fidelity to create the required perception of realism.
6. Maintain a facilitative approach that is participant-centered and driven by the objectives, participant's knowledge or level of experience, and the expected outcomes.
7. Begin simulation-based experiences with a prebriefing.
8. Follow simulation-based experiences with a debriefing and/or feedback session.
9. Include an evaluation of the participant(s), facilitator(s), the simulation-based experience, the facility, and the support team.
10. Provide preparation materials and resources to promote participants' ability to meet identified objectives and achieve expected outcomes of the simulation-based experience.
11. Pilot test simulation-based experiences before full implementation.

From INACSL Standards Committee (2016). INACSL standards of best practice: Simulation<sup>SM</sup> simulation design. *Clinical Simulation in Nursing*, 12(S), S5-S12.

2014) suggested guidelines for use of simulation in the undergraduate nursing curriculum (Table 4) (Alexander et al., 2015). The International Nursing Association for Clinical Simulation and Learning (INACSL) was one of the groups participating in development of these guidelines and has issued standards of best practice to help educators design simulation experiences (INACSL Standards Committee, 2016a). Table 5 lists the eleven elements that the INACSL determined are important for every simulation. Faculty engaging in simulation should follow these design standards.

A school of nursing recently reported its experience using the INACSL standards to design a program for sophomores in its foundation of nursing practice course. The students had not yet had clinical experience; they also were newcomers to simulation-based education. After the program, 80% of students felt they had engaged in a valuable learning experience that helped stimulate critical thinking (McDermott, Sarasnick, & Timcheck, 2017).

Interprofessional simulations have been shown to enhance understanding of roles and improve communication skills that are critical to the team approach to health care (Lateef, 2010; Niemeyer, 2018). One of the INACSL standards deals specifically with simulation-enhanced interprofessional education, a topic frequently discussed at the summit. The standard emphasizes the importance of addressing potential barriers to interprofessional education,

including the readiness and commitment of the organization, and of evaluating its effectiveness (INACSL 2016b).

## Simulation as an Educational Assessment

Assessment of student learning is an essential part of the educational process, and simulation may be useful to test students' performance (Oermann, Kardong-Edgren, & Rizzolo, 2016b). Feedback from facilitators in the debriefing phase of simulation offers immediate evaluation. Students who need further experience can engage in repeated deliberate practice in the simulation setting. A simulation-based remediation course may improve skills of students who need additional help and practice (Ochylski, Aebersold, & Kuebric, 2017).

In addition to individual scenario debriefs as assessments, summative simulation-based assessment might be useful to determine students' readiness for practice (Oermann, Kardong-Edgren, & Rizzolo, 2016a). However, experts at the summit cautioned about grading students' simulation performance until faculty are thoroughly trained and inter-rater reliability is established. This is an especially important and challenging consideration for summative assessments, which may carry high-stakes consequences, such as determining whether students will pass a course or graduate.

## Faculty Training in Simulation Still Lags

Another recurring theme at the Innovations in Simulation summit was that an educational program is only as good as its faculty. Smiley (2019) found that only 60% of faculty have received formal training in running or debriefing simulations. Training often has been mainly by manikin vendors or on the job, with newcomers to simulation learning from faculty with some experience in the field (Breymer et al., 2015; Jeffries, Dreifuert, Kardong-Edgren, & Hayden, 2015a; Starkweather & Kardong-Edgren, 2008).

In a recent survey among APN educators in the United States and Canada (Nye, Campbell, Hebert, Short, & Thomas, 2019), 36% of respondents cited lack of faculty knowledge and comfort as a barrier to providing simulations. The most common way they reported receiving simulation training was self-training (55%), a method that none preferred. The most preferred methods for simulation training were training within the institution (62%), outside simulation conferences (49%), online training (45%), one-on-one mentoring with trained faculty (44%), certification as a Certified Healthcare Simulation Educator (25%), and participation in the Leadership Development for Simulation Educators program of the National League for Nursing (25%).

The National Council of State Boards of Nursing study of 10 nursing schools demonstrated the intensity of faculty preparation necessary for simulation. In multiple sessions

over the course of a year, faculty received instruction in interventional pedagogy, study design, debriefing to guide reflective discussion, and the evaluation instruments (Hayden et al., 2014). One reason for the extensive training in this study was to assure consistency across the study sites, but similar faculty preparation also is important for a single-site simulation program (Jeffries et al., 2015a,b).

## Who/What is Driving Simulation Innovation and Best Practices

Many leaders in simulator development were originally anesthesiologists who were also engineers, by virtue of their education, funding, and budgets. Current innovation in simulation is being driven by cost and new health disciplines adopting simulation. Most simulation budgets do not provide for extended manikin warranties and are often not planned for replacing aging manikins. Thus, manikin developers are now catering more to the budget conscious simulator shopper and developing various price points and equipment options. Innovations in virtual reality may soon rapidly overtake manikin-based simulation (Forneris & Tiffany, 2017).

Nursing has taken the lead in updating best practices by periodically re-evaluating and collating best practices and evidence in simulation. These updates are published in the INACSL Standards of Best Practice: Simulation<sup>SM</sup> (<https://www.inacsl.org/INACSL/document-server/?cfp=INACSL/assets/File/public/standards/SOBPEnglishCombo.pdf>). Recently the Association for Simulated Practice in Healthcare has also published standards for simulation-based education (<https://aspih.org.uk/standards-framework-for-sbe/>).

## Conclusions

Simulation is here to stay; its use is increasing as an educational modality for health care professionals. As part of the prelicensure nursing curriculum, simulation is a method for learning and perfecting basic technical skills as well as for practicing delegation, prioritization, and interpersonal skills such as caring and empathy. Simulation continues to add value at later stages of learning and training, such as in advance practice and other programs for students who already have a nursing license. Practicing professionals benefit from simulation, both individually and in interprofessional teams. Most importantly, simulation helps students and professionals develop and hone critical judgment and clinical decision-making abilities that are essential to optimal patient care.

Following guidelines that professional organizations have issued will assure that simulation programs are optimally designed. Both careful planning for simulation

and training of facilitators are essential to a program's success.

The most common simulation outcomes measured to date regard participants' perceptions; they show increased self-confidence and satisfaction with learning through simulation. Studies have almost always indicated increased knowledge immediately after a simulation experience (Cant, Levett-Jones, & James, 2018; Niemeyer, 2018). We now have ample research about student satisfaction; it is time to move the field forward by designing research that provides evidence of long-term retention of knowledge, transfer of learning to the clinical setting, and improved patient outcomes as a result of simulation.

Attendees at the simulation summit suggested that an efficient way to begin would be for simulation organizations to collaborate on establishing a shared research agenda and to publicize it widely to simulation experts across all settings. This shared approach could harness the best trends in simulation research, which were discussed at this conference. A robust and iterative research plan is important to validate the benefits of simulation and to identify its weaknesses. These findings are essential to shape the future of simulation education and to link it to improved patient safety outcomes. The value proposition of simulation and the pedagogy is all about preparing our future health professionals to provide safe, quality care.

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## **Appendix**

### **Innovations in Simulation Summit Attendees**

The following attended the first annual *Innovations in Simulation Summit*: on October 2018 at Columbia University School of Nursing. The authors gratefully acknowledge the input, ideas, and insights presented by the entire group, which have informed this paper.

Blinded for Review.