

Leading Improvements in Rural Healthcare through Mobile Simulation

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Abstract

Simulation in Motion – Iowa (SIM-IA) is a high-fidelity simulation education for healthcare providers throughout Iowa. SIM-IA is administered by the University of Iowa College of Nursing with mobile simulation trucks in Iowa City (east), Des Moines (central), and Sioux City (west). SIM-IA's goal is to provide simulation continuing education to improve patient outcomes. In year one, SIM-IA provided 110 sessions for over 2,200 providers. Second year goals include expanding from EMS providers to hospital and long-term care facility providers. Major implementation challenges include planning, budgeting, and supplies during COVID-19 pandemic, decentralized simulation staff, fiscal sustainability, and diverse local EMS protocols.

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Introduction. Iowa has ninety-nine counties and all but three have at least one hospital. The state has eighty-two critical access hospitals (CAH), over 400 emergency medical services (EMS) agencies which transport patients, and another 400 basic EMS services (e.g. law enforcement, first responders, fire departments) which do not transport patients. A needs assessment performed in 2019 found that many EMS services had little or no budget for continuing education (CE). Additionally, CAHs had limited CE budgets for clinical providers. Most CE given to EMS providers at the time of the needs assessment consisted of lecture presentation once a month or viewing a recorded presentation. Findings were similar for CAHs where CE was conducted largely via third-party computer-based review, without simulation-based education (SBE). A survey of EMS providers and hospital educators showed they preferred hands-on interactive learning and SBE.

Benefits of Mobile Simulation-Based Continuing Education. The benefits of SBE and interactive CE for healthcare providers have been confirmed in multiple studies.^{1,2} There are also many known impediments to SBE including: cost of space and simulators, availability of trained educators, and the loss of healthcare providers who are needed to provide care during training. High-fidelity healthcare simulation centers are usually located within or proximate to a health education facility or a larger academic medical center. “Brick-and-mortar” facilities are filled with health education students receiving pre-licensure education and hospital-based healthcare providers receiving CE. Making it difficult for outside providers to get access to SBE. Additionally, smaller healthcare facilities are not able to purchase high-fidelity simulation equipment or do not have trained personnel dedicated to provide SBE.

Most EMS providers in Iowa are volunteers and may be the only emergency response providers in their town or county. To receive simulation education EMS providers often travel to a distant simulation center, which deprives the community of EMS personnel while they are gone. Additionally, volunteer EMS providers may be expected to pay for their education and/or travel costs. The total cost of sending an EMS provider to a weekend conference to receive SBE was estimated to be around \$1,200 per person. Bringing SBE to EMS and hospital providers in their communities provides many benefits such as being able to educate multiple providers at the home site versus sending one to a center. Secondly, performing onsite simulations using the providers normal equipment (in-situ) may highlight process gaps that would not be uncovered in a free-standing simulation center. This was experienced simulation events previously coordinated by the authors and in SIM-IA in-situ simulation experiences. One onsite simulation involved calling for additional personnel to help in a maternal crisis. They never arrived because the entry point to the unit was automatically locked after hours for security purposes. Personnel

were not aware of the recent safety change until the in-situ simulation. Another site needed a medication to treat a simulated operating room emergency. When pharmacy was called, OR staff were told the medication was no longer stocked due to expense and frequent expiration. Finally, a dysfunctional automatic external defibrillator (AED) was discovered when used during a mock cardiac arrest. Simulations in a simulation facility would not have identified these process issues.

Development of SIM-IA. In early 2018, Drs O’Sullivan and Bunch became aware of grant-funded opportunity to bring SBE to rural Iowa. Dr. O’Sullivan and colleagues had been providing SBE at CAHs for about 5 years and Dr. Bunch was an expert in rapid response teams (RRT), president-elect and advisory committee member for the International Rapid Response Society, with experience in simulation education for undergraduate nursing students. Dr. O’Sullivan and Bunch explored the grant requirements and felt the University of Iowa College of Nursing had the vision and support to lead this ambitious SBE for CE in Iowa. The University of Iowa is a research level one university with highly ranked Colleges of Nursing, Medicine, Pharmacy, Dentistry, and a large academic medical center (AMC). The colleges and AMC have multiple simulation programs to support learning and many personnel who have been certified as Simulation Healthcare Educators (CHSE) by the Society for Simulation in Healthcare (SSH). This combined expertise along with strong professional connections to multiple SBE collaborators at the AMC provided a supportive environment for the initiation of SIM-IA.

Drs. O’Sullivan and Bunch developed an internal proposal and presented the concept of SIM-IA to Dean Zerwic with the University of Iowa College of Nursing. A subsequent CE needs assessment of EMS agencies and healthcare providers in Iowa was completed using the 2017 Iowa State Emergency Department Data (SEDD) set available from the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP). This data was combined with surveys of EMS providers and system supervisors, hospital emergency department (ED) providers, and hospital administrators in collaboration with the Iowa Bureau of Emergency Medical and Trauma Services and the Iowa Hospital Association to provide a holistic view of healthcare provider CE needs. The needs assessment found statewide support for a SBE CE program from providers, hospitals, and EMS agencies.

Program Development to Initial Implementation. One of the biggest challenges for SIM-IA was planning and budgeting during the middle of the COVID-19 pandemic along with pandemic supply-chain issues. Developing a multi-million-dollar budget in 2020 when companies were unable to give an estimate of when equipment would be available or predict future costs was extremely challenging. For example, a large part of the annual budget was diesel fuel to move the mobile simulations labs (trucks) across the state. In 2020, diesel was at a historically low price per gallon which was anticipated to spike

post-pandemic, necessitating estimating fuel costs 4-5 years into the future. This was done by collecting data from government and private resources on fuel costs over 20 years and forecasting into the future. Estimating too high would be viewed poorly by the granting agency while estimating too low would severely hamper the program's ability to deliver education. The high-fidelity simulation equipment would normally have been trialed in person but this was not possible during the pandemic. Manufacturers provided marketing brochures and other documentation, as well as provided videoconference-based demonstrations of equipment. However, evaluating over a million dollars-worth of simulation equipment without touching or trialing it in person was very challenging.

SIM-IA was funded in January 2021 and Dr. O'Sullivan and Bunch quickly began ordering the custom mobile simulation trucks, simulation equipment, and task trainers given the current supply chain issues being seen across the United States. While the mobile simulation units were being custom built based on an existing template, but the process was delayed by supply chain issues for the chassis as well as many specialized parts requiring many zoom calls with the manufacturer. Overall, the arrival of the trucks and simulation equipment was delayed by almost a year which required additional efforts to keep local stakeholders interested in the development of SIM-IA. In order to work around pandemic supply-chain issues, the simulation equipment for the first truck arrived 6 months prior to receiving the first truck creating storage issues. The College of Nursing redesignated a small meeting room into a temporary storage and work room for SIM-IA simulators. The mobile simulation trucks are 44 feet long by 12 feet wide and 14 feet high, about the size of a fire engine pumper truck. Process the purchasing agreement required submitting an address for the physical storage location of the trucks. Since it was not feasible to secure a climate-controlled garage for over a year while the trucks were being built, Dr. Bunch's third floor office in the College of Nursing was the first address of record for all three trucks. Despite the fact that the trucks do not fit in the elevator or in her office. Timing the delivery of simulation equipment, the arrival of three large trucks, and the hiring of personnel to be stationed in three locations hundreds of miles across the state is not a typical skill set for most nursing professors requiring leadership, creativity, and innovation.

The educational vision for the program was to provide standardized evidence-based education while complying with state EMS regulations and local EMS protocols. A program director was hired 6 months prior to program launch (i.e., receipt of the first truck) to time to build relationships across the state and begin to build the SIM-IA team. An educational coordinator was tasked with the responsibility for the educational mission of the program, developing and troubleshooting scenarios, and training the staff who would provide education across the state. Having the educational coordinator begin 3 months prior to program launch allowed the creation, pilot testing, and customization of clinical =scenarios with local EMS providers using SIM-IA program equipment and existing classroom spaces. While this did not

provide the physical environment and equipment available in the simulation trucks it was significantly more engaging for participants than watching on online videos or presentations in a garage.

Launching SIM-IA. The first truck arrived in Iowa on June 21, 2022, four years after the needs assessment and two and a half years planning and budgeting began. Coincidentally, Iowa hosts RAGBRAI, an annual week-long bike ride, in July. About 30,000 bicycling enthusiasts from across the state, country, and globe ride bikes across the entire state passing through small towns and camping overnight in larger communities. On such a ride in the summer months when temperatures are in the mid-upper 90s, there are minor accidents and medical emergencies throughout the week. The timing of RAGBRAI 2022 provided a perfect kickoff event for SIM-IA's launch. The eastern truck drove across the west to east route bicycle route, stopping in the seven towns overnight and pass through towns educating EMS personnel and in-hospital nurses on typical bike ride injuries including cardiac arrest, heat stroke, and seizure protocols. Dr. Bunch led many of the clinical simulation sessions as an educator since the program was not yet fully staffed. The education was unanimously well received by the providers. For the article's authors, this event clearly demonstrated the importance of SIM-IA and the potential to impact healthcare across the state.

Following the launch of SIM-IA, the day-to-day work began in securing home bases for the western and central trucks, hiring expert clinical staff, and building the vision of SBE in rural Iowa. As the University of Iowa is in the eastern third of the state, the first (eastern) truck was based near Iowa City. Securing locations for the western and central trucks required additional planning and strategy. While there was great support for the program in the western and central areas of the state, there was limited capacity for hosting this large mobile simulation truck in a climate-controlled environment. As such, the first year saw the eastern truck staff driving across the state adding more miles and using fuel than planned to keep interest alive and fill requests for SBE. Serving these areas from the east required complex scheduling and additional time and effort from the eastern Iowa staff. From a budget standpoint it was neutral because even though expenses for the eastern truck were higher, there were no travel or staff expenses for the other two trucks.

Through our work with Sioux City Fire Rescue on SIM-IA's pre-RAGBRAI event in their training facility, our team developed a strong working relationship with the Fire Chief and his leadership team. Based on this relationship, the fire chief suggested we locate a truck with Sioux City Fire Rescue (SCFR) training facility as the western SIM-IA base. After a period of negotiation between university representatives and Sioux City administration, a memorandum of understanding was completed in late 2022 to house the truck with SCFR with additional SBE support for their EMS crews by the SIM-IA team. The next step was identifying the right person to lead the western SIM-IA team, which delayed the

launch of that truck to April of 2023. Until a full time leader was hired in June 2023, Iowa City educators drove 5 hours one-way to Sioux City at least once a month to mentor part-time staff and provide education to SCFR and western Iowa EMS providers. The response to SBE CE from western Iowa EMS providers was just as positive as in eastern Iowa. These positive experiences contributed to the endorsement of the program by the SCFR fire chief to Des Moines Fire Department (DMFD) chief. Ultimately this led to SIM-IA partnering with DMFD as the central base for SIM-IA with a completed MOU in early 2023. Identifying full-time leadership in both locations as been challenging as salaries for nurses and EMS providers rose significantly during the pandemic and have remained elevated compared to budget. This necessitated an increase reliance on part-time staff, subsequent budget review, and increase in the salary ranges.

Future Educational Goals for SIM-IA. Much of the first six months of SIM-IA was spent orienting educational staff to the trucks, equipment, and goals of the program. Many simulations focused on allowing EMS providers the opportunity to practice critical thinking and skills they may not have used in many years in their rural patient populations. All simulations were designed to provide education and NOT a critique of skills. There was not enough time in the sessions to provide unlimited practice attempts or move all providers to a “mastery” of skills they might be expected to perform in practice, however providers are given additional opportunities to perform skills with a goal of achieving basic competency. There is also a focus on team skills and closed loop communication in high stress scenarios.

Goals for the SIM-IA include modifying simulations each year while adding one to two new scenarios annually clinical data and local requests. Provider turnover within local EMS crews and orientation of new SIM-IA team members is an anticipated challenge. Another major goal is to move simulation into the rural Eds, including all ED staff members. A common challenge in rural EDs is workload when SIM-IA arrives for the day of education with no empty beds or staff able to leave patient care to participate. Overstaffing and using the truck versus in situ simulations is a possible solution but most CAHs do not have staff or funding to make this feasible.

At the time of this writing, SIM-IA has completed one full year of education and a second successful pre-RAGBRAI event. Most of the education was provided by the eastern Iowa with the western truck operating for three months and the central truck anticipated to begin in fall 2023. SIM-IA conducted 120 educational events, educated over 2,000 providers, and visited over 54% of Iowa counties in this first year. With all three trucks in operation, the program is on track to serve all 99 Iowa counties in year two. Year two will also see an increase in SBE for hospital EDs and long-term care facility personnel. Learner evaluations have been positive with multiple sites requesting second and third visits.

Moving to Long-Term sustainability. As stated, the program has seen early success. The greatest challenge going forward is achieving long-term financial sustainability to support SIM-IA into the future. Most EMS providers in the Iowa are volunteer and receive little or no funds for CE. An additional desire is to provide free SBE for EMS providers who do not receive financial support for their CE to improve pre-hospital outcomes. Achieving this goal requires a strong business plan and philanthropic support. Funding above and beyond supporting free EMS education provide free or reduced SBE costs for other healthcare providers to further improve health outcomes for Iowans.

Moving to Long-Term Financial Sustainability. A major challenge for the next two years is the ending of grant funding which initiated the program and provided partial operational support for three years. SIM-IA's goal is to provide clinical simulation education to all providers to improve healthcare outcomes for Iowans. However, most EMS providers in Iowa are volunteers who receive little or no funds for CE. SIM-IA has a goal to provide free SBE to improve pre-hospital outcomes and support these first responders within their communities.

SIM-IA has been working with the University of Iowa's robust philanthropic support team since inception to notify donors of this opportunity and create avenues for funding support. Multiple generous donors have sponsored a day of education, covering the expenses of SIM-IA to provide SBE providers in their communities. Legislators and other state leaders have identified SIM-IA as a visionary resource to improve the health of Iowans. A final avenue for revenue will be billing providers for CE when feasible.

Conclusion. Simulation in Motion – Iowa successfully launched in 2022, providing crucial SBE to improve healthcare outcomes across the state. What started as a vision to provide high quality simulation-based education (SBE) to EMS providers and nurses throughout the state has quickly expanded to all healthcare providers. Thankfully the program has a wonderful director, educational coordinator, office manager, and dedicated truck leads, staff who love to educate, and an abundance of educational requests. The final remaining challenge is financial sustainability which must be achieved to benefit all Iowans. SIM-IA is an investment in the health of Iowa and support for healthcare providers.

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