24 Simulation for Rural Communities

Linda L. Brown and Ralph James MacKinnon

Simulation Pearls

1. As with any educational endeavor, it is important to clearly identify the objectives before starting a rural simulation program. Is the focus on teamwork and communication, assessment of the systems and processes of care, procedural training, or another topic? Clarifying these objectives will lead to the best methods for training.
2. In situ and mobile simulations are two useful methods for training in rural settings.
3. Consider collaboration with other local or regional centers to further expand your simulation resources.
4. Advance planning and buy-in by both stakeholders and participants are critical for developing and sustaining a successful rural simulation program.

Introduction

The term *rural* is defined by the *Merriam-Webster's Dictionary* as "relating to the country and the people who live there, instead of the city" [1]. In the medical literature, this definition varies and can even be controversial. There is often an attempt to incorporate the population density of the area in question or the proximity to urban centers, but ultimately the definition may be unique to each country or region. The identification of these rural communities is important, however, to allow for discussion of some of the challenges these areas may face, including the need to provide high-quality health care to ill and injured pediatric patients. In the USA, it is estimated that approximately 20% of the population live in rural areas, while less than 10% of physicians practice there [2]. Similar numbers are reported in other countries [3]. In these rural communities, healthcare providers are required to administer care to patients distributed over a broad geographic area, yet are fully integrated into the local community [4]. Hospitals in these areas often have a lower patient census and limited access to subspecialty consultation as compared to larger urban centers, but they are still required to provide safe, effective, equitable, and efficient care to all who enter their doors. For the purposes of this chapter, we will discuss simulation-based education (SBE) and its potential utility and impact on pediatric education and training in these rural communities. Of note, SBE in *resource-limited settings*, areas typically characterized by insufficient healthcare funds resulting in a lack of infrastructure, trained personnel, equipment, supplies, and medications, will be discussed separately in Chap. 25.

The optimal care of acutely ill and injured children requires ongoing education and frequent practice by members of any healthcare team. Many of the children who receive emergency care are seen in community hospitals with relatively low pediatric volumes, rather than larger academic children's hospitals. In fact, it is estimated that 85–90% of children presenting for emergency care are seen by general emergency medicine physicians in community emergency departments (EDs), while 50% of EDs in the USA care for fewer than ten pediatric patients per day [5–8]. In the rural setting, the management of critically ill infants and children is a rare event, and the providers often have limited access to pediatric consultants and pediatric-specific continuing education. In 2008, an attempt at mapping the access to pediatric subspecialists and hospitals with pediatric intensive care units in the USA was published. The authors found that overall 64.1% of the pediatric population lived within 50 miles of a pediatric critical care resource. However, there were multiple states where this number was less than 10% [9].

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Published literature also reports that there is variability in the quality of care delivered to pediatric patients in this lower-volume community setting as compared to higher-volume children's hospitals [10].

In discussing SBE and its use for pediatric education in rural communities, an important component of the review must be focused on why simulation is being considered for use in this setting. As with any educational endeavor, predetermined learning objectives should be set by those responsible for its implementation. Are these objectives related to improving medical knowledge, assessing skills or competencies, practicing interprofessional teamwork and communication, or as a tool for the assessment of the systems and processes of care in this setting? Although these topics will be covered in detail in other chapters, we will discuss each topic to discuss how simulation may be utilized for pediatric education by healthcare providers, administrators, or educators in rural communities, as well as some of the challenges and facilitators to its use in this unique setting.

Assessing and Improving Medical Knowledge

Medical decision-making and clinical reasoning have classically been taught in a lecture-based format, refined at the bedside during training, and maintained through clinical practice. Over the past decade, SBE has been proved to be an engaging and effective method for educating medical professionals and has become an integral component in this process. Not surprisingly, the highest utilization of simulation is often centered in urban, tertiary care teaching hospitals. In this environment, it is frequently used as a method to teach trainees and established healthcare providers the best practices for managing a variety of medical emergencies. In rural communities, where there are low pediatric volumes, pediatric-specific knowledge and skills may deteriorate quickly. Unfortunately, the options for pediatric continuing medical education are also often limited in these areas, and it is here that simulation can play an important role. Even in centers with fewer resources, medical decision-making can be practiced and assessed through the use of screen-based simulation programs, often referred to as online or computer-based simulations or serious gaming. This method of SBE allows for easy access to pediatric-specific scenarios and education. It allows the providers to walk-through their decisions regarding care with infinite possibilities in the patient's progression depending on their interventions, as predetermined by programming in the game's engine. Examples of the use of gaming for rare and acute events include disaster triage and emergency department or Pediatric Advanced Life Support (PALS) scenarios. This time-critical decision-making allows for experiential learning, with the online or computer-based setting allowing for a more readily accessible training opportunity for all healthcare providers. Screen-based simulation is discussed in further detail in Chap. 9.

In Situ and Mobile Simulation

In situ simulation is an event that takes place in the actual clinical environment, allowing the healthcare team to practice caring for patients in their own space, with their own equipment and resources (see Chap. 12 for details). It has been shown to deliver high levels of realism and participant satisfaction [11, 12]. Through observation of the team's performance during a simulation scenario, an expert in debriefing can introduce discussion on published guidelines and updates in the literature on the optimal care of children presenting with a variety of complaints, from pediatric respiratory failure, sepsis, and trauma-related complaints to cardiac arrest.

The use of SBE for pediatric education in Critical Access Hospitals in the USA has been evaluated [10]. Critical Access Hospitals are small-volume rural institutions with no more than 25 inpatient beds but with 24-h, seven-days-a-week emergency care units. These facilities are maintained to provide access to emergency and outpatient care for rural communities, with patients requiring prolonged admission or subspecialty care transferred to other institutions. Not surprisingly, healthcare providers in these settings will infrequently encounter critically ill children. In this study, a high-fidelity in situ curriculum was developed to allow providers to practice the care of such pediatric patients. Although no information has yet been reported on the impact of this intervention on actual clinical care, at the conclusion of the study providers reported significant improvements in their comfort level in taking care of these patients [11]. These findings are supported by other studies with similar programs where healthcare providers have reported increased comfort with these infrequent, high-acuity events at the completion of a simulation-based intervention [13, 14].

Although SBE may be best known for allowing healthcare providers to practice these low-frequency, high-acuity events, for healthcare institutions it may also be used to provide insights into the preparedness of the system to care for these patients. In situ simulation is being increasingly used for this purpose and has been shown to efficiently and effectively assess the systems and processes of care in a variety of settings [15–17]. In 2006, in situ simulation was used to evaluate the care of pediatric trauma patients presenting to a spectrum of EDs in North Carolina. The ability of interprofessional teams to assess and manage a simulated 3-year-old trauma patient after a fall was evaluated. Information on the quality of care delivered was assessed, as well as several system-level issues, including the lack of appropriate-sized equipment (e.g., cervical collars) and inadequate preparation for safe transport to computed tomography (CT) scan [18]. Similar methods have been used to assess the systems and processes of care, and to evaluate for latent safety threats in both established and new clinical environments [15, 17, 19]. In rural institutions, where pediatric-specific systems are rarely tested, this could be an invaluable tool for quality improvement (see Chap. 6 for details).

It is important to acknowledge, however, that there are challenges associated with in situ simulation, particularly in the rural setting. These include the need to provide actual clinical space and equipment. In areas where the space for clinical care may be limited, this will require significant planning on contingencies for what to do when an actual patient arrives. It is very important that discussions prior to the day of the simulation involve administration as well as physician and nursing leadership.

As transporting all rural providers to a distant simulation center for training or developing a local in situ simulation program, as described above, may not be feasible, the use of *mobile* simulation is becoming increasingly utilized. In this method, the simulation-specific resources are brought to the participants. Mobile simulation occurs in one of the two ways. The first way is the transportation of mannequins, equipment, and simulation facilitators to the rural environment for in situ simulation as described above (see Fig. 24.1a, c). The second way includes all of the human and equipment resources listed above, as well as a *mobile patient care space*, often in the form of a repurposed ambulance, recreational vehicle (e.g., motorhome or caravan), van, or bus (see Fig. 24.2a, c). This allows for a standard practice environment, one that is not impacted by actual patient care as seen in in situ simulation. Individuals and interprofessional teams can practice procedures or high-fidelity simulation scenarios without the need for each rural institution to purchase and maintain costly simulation equipment and resources. However, there are specific questions to ask prior to creating, building, or participating in such a program. Important discussion points that should be considered for in situ and mobile simulation space methods are detailed in Table 24.1.

Fig. 24.1 Examples of a *mobile simulation unit* designed to transport in situ stretchers, simulation equipment, clinical equipment, and the education team that will perform the training. (Reproduced with permission of eSIM Provincial Simulation Program, Alberta Health Services)

Fig. 24.2 Examples of a mobile simulation unit designed to include a: (a) mobile patient care space; (b) and all associated simulation equipment, clinical equipment, audiovisual equipment; and (c) a control room. The unit is designed to be completely self-dependent for simulation education delivery. (Reproduced with permission of STARS Air Ambulance)

Table 24.1 Questions to consider when planning for in situ or mobile simulation

In situ simulation	
Will we use our own equipment and medications?	This will require thought as to how medications will be accessed, how quickly can the equipment be replaced, and how to cover the costs associated with replacement
If not, how can we be sure that the simulation equipment and medications are not used on actual patients	This will require special labeling and storage, as well as specific checks to confirm that no contamination occurs
If safety threats are identified, how will they be reported?	Immediate safety threats should be reported in real time to physician and nursing leadership. How will these be tracked for resolution?
Will the actual medical team be participating in the simulation? If so, what will happen if a patient arrives for care?	Back-up providers or a plan to halt the simulation based on preset criteria are possible solutions. In addition, how will the costs of additional staffing be covered? What is the optimal number of participants for the simulation? Ideally, this should be representative of actual practice
Where/when will the simulation take place?	Is there a specific resuscitation room we would like to utilize? What is the best time of the day to use this room? Lower volume times are often earlier in the morning. How long do we want the sessions to last? Discuss how long it is possible to use this space without affecting patient care/flow
Mobile simulation space	
Are we interested in assessing our equipment or resources or the processes of caring for pediatric patients?	If so, in situ methods may be more appropriate. If not, how can we be sure that equipment adequately mirrors our own equipment to allow for optimal buy-in by participants?
How will the participants be oriented to the mobile simulation lab?	Time will need to be set aside for an overview of the mobile setting, allowing for hands-on practice with equipment if necessary
How will this be funded and staffed?	Are the participants being paid for their time? What is the optimal number of learners? Does this replicate actual practice? Can we apply for continuing education credits as an incentive for providers?
Where will the mobile simulation lab be located?	Is this location easily accessed by participants and not obstructive to patient care?

It is important to recognize that endeavors such as these require significant simulation resources. Not only do they involve the use of mannequins and the technology to support these simulations, but also the experts available for facilitation and debriefing, arguably the most important component of a successful SBE program. As mentioned previously, acute care pediatric expertise may be limited in rural communities. To address this issue without the expense of mobile simulation, the utilization of telemedicine has been steadily increasing. This technology allows for immediate consultation with subspecialists regarding the care of pediatric patients and has been shown to have a positive impact on the quality of the care delivered [20–22]. Similarly, the use of telemedicine for educational purposes is now being investigated and may allow for remote debriefing and facilitation of simulation scenarios and procedural training when the expertise is not locally available [23].

Interprofessional Teamwork and Communication

For the purposes of interprofessional education, including critically important teamwork and communication skills and behaviors, mannequin-based simulations have long been utilized and found to be both engaging and effective [12, 24, 25]. A number of simulation-based studies have also identified the importance of teamwork, good leadership, and good communication in managing emergency situations and their role in medical error when they are suboptimal [26–28]. Teamwork training has been shown to improve subsequent team performance ([29–31] (see Chaps. 4 and 15 for details). SBE has also produced a host of tools to assess both technical and nontechnical skills, which may also be useful in the rural setting [32–37]. See Chap. 7 for a complete list of assessment tools for pediatrics.

Another area of recent interest that has applicability in the rural domain is that of cognitive aids, including checklists. In other high-reliability professions, such as in the aviation and nuclear power industries, checklists and simulation are used as standard for the management of rare but high-acuity events or stressor situations [38–40]. In the healthcare field, there is evidence supporting improved patient safety outcomes with the use of checklists, including the use of a preoperative checklist that has demonstrated a reduction in communication failures [41–43]. The improvement in the management of operating room crises demonstrated by the use of checklists with training on simulators within a simulation suite may be a step toward improved patient care for rare events in the rural setting using the same checklist approach.

When creating these programs, it is important to recognize that the realism of the scenario can be an important component of the buy-in by the participants, and this knowledge should be considered, along with the predefined learning objectives, during scenario development. Realistic scenarios that are possible encounters in each setting should be carefully planned and piloted prior to their use. This is not the time for rare cases but rather straightforward, plausible cases with well-established guidelines for medical management, such as sepsis, PALS algorithms, and status epilepticus, that allow for not only the building and consolidation of fundamental pediatric acute care knowledge but also the practice and discussion of important teamwork and communication principles. Building fundamental knowledge and skill in the more common pediatric presentations will have the greatest impact on children care for by rural providers, and will likely also provide positive spin-offs when having to care for rare cases. Piloting the scenarios with input from physicians, nurses, and other participating healthcare providers will also allow for problem-solving and amelioration of any possible threats to a successful program.

Collaboration in Simulation-Based Education

Access to simulation technology and expert facilitation and debriefing, which provide much of the learning and mentorship during simulation-based educational programs, is often limited in rural communities. Through collaboration with larger academic centers, however, access to this educational modality may become possible. Each rural community is unique in its objectives. Many site-specific factors can affect the best way to successfully develop and sustain a simulation program, including the location, the patient volume, the diversity of patient complaints and acuity, relevant equipment, and personnel resources. Sites with established affiliations with larger academic institutions may be able to access simulation through this relationship. However, smaller, more isolated sites may have difficulty in accessing these resources. In several areas worldwide, the academic institutions have facilitated this relationship through collaboration with other centers for dissemination of SBE across larger areas and a broader spectrum of institutions.

In 2012, findings from a regional Canadian task force on simulation were published [44]. The British Columbia Simulation Task Force was created "to bring together key academic and health authority stakeholders from across the province to design a comprehensive SBE model…" In this manuscript, methods and findings from a needs assessment are described and an educational model to provide access to SBE for all healthcare providers in British Columbia,

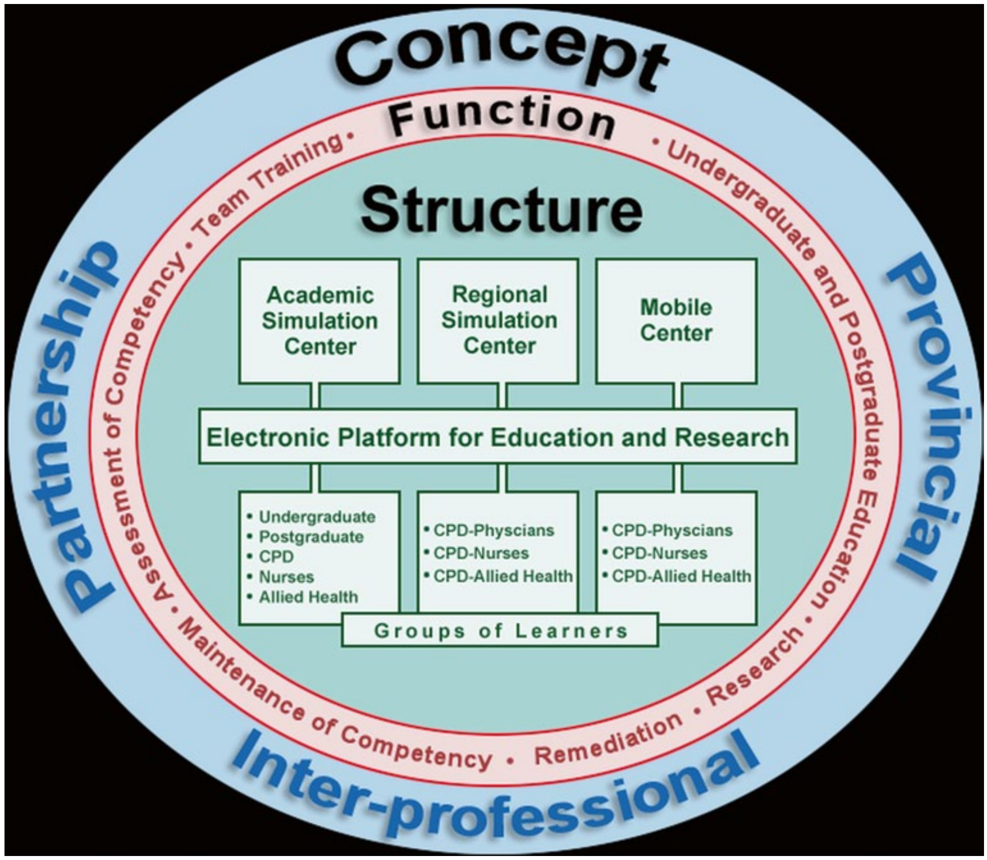


Fig. 24.3 Model of simulation for rural settings. *CPD* continuing professional development. (Used with permission of [44])

irrespective of their geographic location and/or institutional affiliation, is discussed. They determined that using a combination of online, web-based learning, followed by access to academic and regional simulation centers and mobile simulation centers, utilizing specially designed mobile units with in situ simulations for rural settings, is an optimal model (Fig. 24.3). They report that the implementation of this system is currently underway but stands as a model for collaboration between academic centers and community-based hospitals to provide SBE for all who desire it.

In our experience, building such an outreach program requires mutual trust and respect. Developing this relationship can be markedly different from that of introducing simulation internally to another department in a base hospital. In Table 24.2, we list considerations that may facilitate such relationship building.

As relationships and trust build, broader collaboration within a wider geographic area and standardization of curricula across these centers become possible. The content of the curricula can still contain objectives that are seen as important to the rural centers, while also covering known cases where rural teams have struggled with pediatric care. The KidSIM Pediatric Simulation Program (Alberta Children's Hospital, Calgary, Canada) runs a mobile rural in situ simulation program in Southern Alberta, Canada, that delivers 12 standardized scenarios over a 4-year period (i.e., three scenarios per year). The advantage of the standardized curricula is that they allow the simulation program education team to more intimately learn the three cases for the year and repeat the cases at each of the rural sites for a given year. This is a practical way of ensuring that the cases remain consistent and are of high quality. The main advantage for the rural sites is that they are delivered a consistent set of cases that are felt to be necessary to build fundamental knowledge, clinical and team skills in pediatric acute care driven by objectives developed mutually. In addition, by standardizing the cases (and program), continuing education credits are more easily applied for, which acts as an additional motivation for rural care providers (Vincent Grant, written communication, December 2014). Regional transport teams that support rural or district hospitals, by a rapid response team or telephone advice, may also form an anchor point for collaborative simulation curricula. With knowledge of all the critically ill children presenting to the hospitals within the region, The North West & North Wales Paediatric Transport Team (NWTS, UK) outreach program aims to provide mobile SBE programs responsive to specific educational goals of 28 hospitals each year (Kate Parkins & Kathryn Claydon-Smith,

Table 24.2 Developing a rural simulation outreach program from a base center: relationship building

Key task	Steps for implementation
Introduce the concept to key interprofessional and multidisciplinary stakeholders	Discuss the acceptability of simulation within the rural team setting
	Inquire how simulation may be of the highest value in their setting
	Explain options for education, team training, and process improvements
	Suggest starting based on your own hospital's successes with simulation
	Identify educators within the rural facility to help champion this process
	Talk through the simulation, highlighting plausible scenarios, and debriefing points
	Suggest outcomes and how to track simulation interventions
	Discuss costs of equipment and staff time and the increasing scale of complexity
	Consider applying for continuing education credits for providers
Organize an event to meet as many staff as possible and show the technology	Involve the rural team in a live demo and promote reflection on this
	Develop together a remediation plan for any staff member who may request or require this after completion of the simulations
Establish regular meetings/teleconferences to build relationships further	Discuss progress and challenges
	Plan for new scenarios
	Expand the number of local champions
	Review outcomes
Consider collaboration across a wider geographic area to build a standardized curricula for multiple rural centers	Discuss other potential local or regional collaborators
	Consider potential for sharing resources, curricula

Fig. 24.4 Simulation within an educational area at the base (rural) hospital with permission of The North West & North Wales Paediatric Transport Service (UK)

written communication, December 2014). These simulation-based educational programs are planned in advance to occur in either clinical areas or educational areas in base hospitals (Fig. 24.4). A number of differing approaches may be undertaken to achieve collective collaborative educational goals. Different examples of rural simulation-based itineraries are presented in Table 24.3.

Procedural and Skills Training

One of the main objectives when discussing SBE is the acquisition and assessment of infrequently practiced skills and procedures. Simulation has been proven to be an effective tool for teaching and maintaining competencies in a variety of procedures that require refined and practiced

Table 24.3 Examples of collaborative rural simulation-based education itineraries

KidSIM Pediatric Simulation Program (Alberta Children's Hospital, Calgary, Canada)	Morning session
Full-day session	1. Skills station with hands-on practice and mentorship (45 min) for all participants (while other team members set up mannequin-based simulation sessions)
Can be done in clinical space (in situ) or in classroom (if necessary)	
Four facilitators	2. Rotation of groups through three immersive scenario-based simulations with debriefing lasting 45 min (Participants divided into 2–3 groups)
Maximum of 20 interprofessional participants	Afternoon session
	A new set of participants and the above skills station and three scenario-based simulations are repeated
The NWTS (UK) in situ Program 1	Morning session—rotation through:
	1. Difficult actual case discussions (1 h)
Full day session	Two cases—one provided by NWTS and one by base hospital (30 min each), for example, lithium button battery ingestion with catastrophic hemorrhage
Emergency department or ward area available	
Four facilitators	2. Case-based procedural workshops with part task trainers (90 min), for example, intraosseous insertion and fluid management
Approximately 20–30 multidisciplinary participants	Afternoon session
	In situ high-fidelity team-based simulation (45 min; team using own equipment, drawing up medications, etc.)
	Half of participants active in simulation, half observing
	Interactive debrief—all participants involved (1 h), for example, management of meningococcal sepsis
The North West & North Wales Paediatric Transport Service (UK) Program 2	Rotation through two sessions in the morning and two sessions in the afternoon
Full-day session	1. Airway case with part task trainer (1 h), for example, management of unpredicted difficult airway
Educational area only available	
Four facilitators	2. Breathing case with mannequin (1 h), for example, high-flow humidified oxygen and setting up noninvasive ventilation in an asthmatic child
Approximately 20–30 multidisciplinary participants	3. Circulation case—part task trainer (1 h), for example, fluid resuscitation of shocked child with intraosseous insertion
	4. Neurological case with mannequin (1 h), for example, base hospital extubation of a child who had status epilepticus responding to thiopentone

NWTS North West & North Wales Paediatric Transport Team

psychomotor skills. These include central venous access placement, lumbar puncture, and emergency airway management techniques [45–47]. It is therefore another useful option for rural healthcare providers who may not have the volume or variety of patients to allow for maintenance of competency in these procedures. This is also an objective that may be accomplished on a relatively low budget, with options for less-expensive, low-fidelity task trainers available for a variety of procedures. Procedural and skills training is discussed in detail in Chap. 11.

Developing Resilience in Rural Communities Through Simulation

Resilience can be defined as the "long-term capacity of a system or society to deal with change and to continue to develop" [48]. The resilience approach focuses on the dynamic interplay between gradual daily occurrences versus sudden dramatic events, and the change required to optimize the responses to such stressor events. This section aims to explore how different simulation-based educational strategies may improve resilience in the rural setting. We will also discuss the potential role of this educational strategy in rural healthcare facility preparation and in particular assessment, dissemination of learning, and healthcare advocacy.

Although discussed previously, it is worthwhile to examine preparation or readiness in more depth. Rural healthcare systems, including emergency medical/prehospital services and hospitals, provide the first response and care for the clinical needs of the majority of children requiring health care. It has been recognized for decades that healthcare system preparation is vital to meet this challenge, in terms of the provision of appropriate personnel, equipment, protocols, and infrastructure from initial resuscitation to transfer to definitive care [49]. Current strategies to improve the capacity of a healthcare system deal with change, and continue to develop, include reviews of care and regulatory interventions at a national or regional level. Healthcare facility level audit cycles and close inspection of untoward incidents also aim to assess, achieve, and maintain high-quality care for children. One example of a national strategy is the 2001 American Academy of Pediatrics (AAP) and the American College of Emergency Physicians (ACEP) "Care of Children in the Emergency Department: Guidelines for Preparedness" document [50]. These guidelines include recommendations for staff training, an endorsed list of age and size-appropriate equipment and supplies, guidelines for policies, procedures, and support for establishing inter-facility transfer agreements. Subsequent studies indicate that despite a national framework and guideline approach, inconsistencies remain in the preparedness of hospitals to care for emergency pediatric patients [51, 52]. In one US study, factors associated with a lack of readiness to care for pediatric emergencies included the availability of services and equipment in rural and community hospitals [52]. A follow-up report by the Committee on the Future of Emergency Care in the United States Health System (Institute of Medicine of the National Academies) highlighted that a significant number of children are first cared for in the community or rural setting, and reemphasized the need for such a healthcare system to be prepared to manage all types of cases [50].

As discussed previously, the case mix presenting in the rural setting is a key issue. The understanding that the lack of frequency of challenging pediatric emergencies not only adversely affects the clinical skills of healthcare providers, but also the rural hospital infrastructure, was a driver to the national guideline development. Another driver for the national guideline approach was a perceived lack of appreciation for the severity of injuries, the urgency of clinical scenarios, incorrect clinical decision-making, and a lack of confidence particularly in caring for critically unwell children [50]. Simplistically, one can visualize two strands to developing resilience in rural health settings: one of better preparation of the healthcare facilities and systems, and another of training to and maintaining the excellent performance of healthcare providers (including paramedics, emergency medical service personnel, physicians, nurses, and other allied health professionals). To date, SBE has played an integral role in developing both strands, but one important future direction may be to highlight how interwoven both strands are and how we can build upon this.

This includes using simulation to encourage healthcare advocacy in all personnel involved in the preparation and delivery of care, including the rural environment. The role of healthcare advocates is essential in improving the quality of care provided within a facility. To act effectively, health professionals must be given the tools to capture the intricate interplay between teams of healthcare providers and the facility they work in. One example of such a tool is the Field Assessment Conditioning Tool (FACT). The FACT (Fig. 24.5) was designed as both a qualitative and quantitative series of evaluations in the context of pediatric trauma in rural hospitals to disseminate both areas of existing excellence in care, as well as areas of focus to further optimize care [53]. The FACT uses SBE as a cornerstone educational intervention and was developed as part of collaborative approach across three continents by the International Network for Simulation-based Pediatric Innovation, Research and Education (http://www.inspiresim.com). The use of simulation-based tools to develop healthcare advocacy and to support decision-making in the rural setting is a potentially fruitful avenue to explore. A current international multisite study aims to determine the effectiveness of such tools, focusing specifically on satellite hospitals geographically linked to major trauma centers in the USA, New Zealand, and the UK [53]. Using high-fidelity simulators as surrogates for traumatically injured children, this study explores the effectiveness of the FACT to empower individuals to invoke clinical management changes within their distinct hospital settings and disseminate the learning across all team members. In the same way that a close clinical relationship between rural and major centers of care is optimal for care provision, it may also be true in terms of education, continued professional development, and process improvement. SBE is therefore a powerful potential conduit to achieve such relationships and provides the opportunity for all of us to learn from one another.

Conclusions

This chapter has described how the spectrum of simulation-based training can provide opportunities for rural practitioners to advance along a novice to expert trajectory, the evidence base behind such a structured simulation approach, the use of simulation in rural EDs to highlight deficiencies and improve performance post-educational interventions, and how in situ simulation could be used to identify latent safety threats in the rural setting [15, 18, 54]. The continual evolution of SBE also provides the platform to address further the challenges of rural healthcare practice, in terms of an effective method of assessing competencies [55–57], the effectiveness of other educational interventions [54, 58], and measuring quality improvement [59]. There are potential barriers to implementing a simulation program within a rural community, including the lack of resources and access to the required simulation-based expertise and equipment. It is therefore important to obtain early buy-in from physician and nursing leadership, as well as hospital administration, as to the objectives of the simulation program. *Is it focused on interprofessional education/teamwork and communication? Procedural skills? Medical decision-making for low-frequency, high-acuity events? Assessment of the systems and processes of care?* Once the objectives for the program

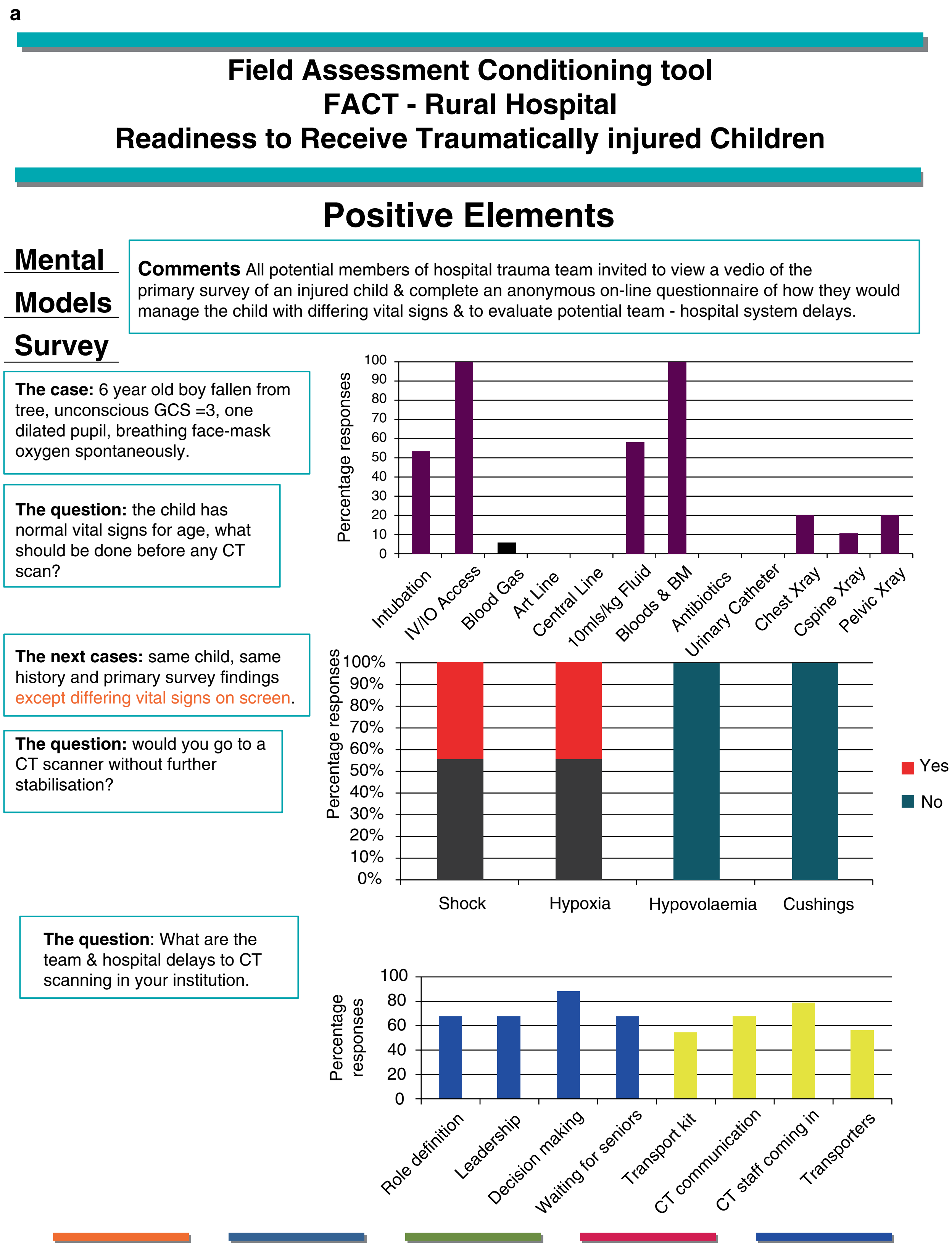


Fig. 24.5 Example of a Field Assessment Conditioning Tool (FACT) report (for hospitals with CT scanning capability)

b

FACT Positive Elements

Site Visit

Comments WHO essential trauma care checlist, maximum 3 scored for all components

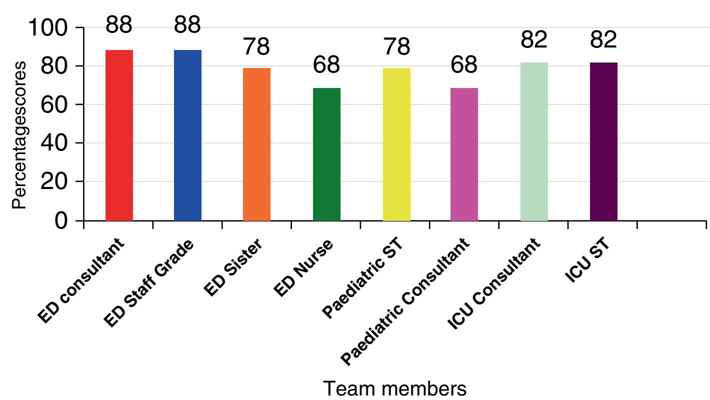
Basic airway management	External haemorrhage control	Splinting of fractures	Documentation
Advanced airway management	IV access&appropriate fluids	Basic closed fracture management	CME certification
Oxygen	Blood transfusion capabilities	External & Intemal fixation	QI program
Chest drains	Wound care	Spinal immobilisation	Trauma Team

Knowledge Test

Comments

50 true/false questions on the management of paediatric trauma completed by a randomly selected trauma team.

Trauma Knowledge Test



Adherence to Best Practice

Key Timings

Comments

2 traumatically injured children (using high fidelity simulators as proxies for patients) presented to the Emergency Dept bays and were managed in trun by trauma call activation and team managemant as per normal care provition.

Best Practice Adhered to:

Primary & secondary survey of Paediatric Advanced Trauma Care Completed.
Immediate life threatening injuries assessed & managed.
On identification of time critical head injury appropriate neuro-protection, planning for transport then imaging & operative intervention under taken at Major Trauma Centre.
Major haemorrhage protocal activated and appropriately managed.

Child One

Time to senior arrival (minutes)	Time to pupil check (minutes)	Time to declaration of dilated pupil	Time to intubation	Time to discussion with major trauma centre
<1	3	4	12	3

Child Tow

Time to senior arrival (minutes)	Time to IV / IO access (minutes)	Time to firstfluid bolus (minutes)	Time to Major Haemorrhage Protocal activation (minutes)
1	2	4	4

Time to Fast Ultrasound Scan of abdomen (minutes)	Time to blood administration (minutes)	Time to discussion with senior surgeon (minutes)
3	15	8

Fig. 24.5b Continued

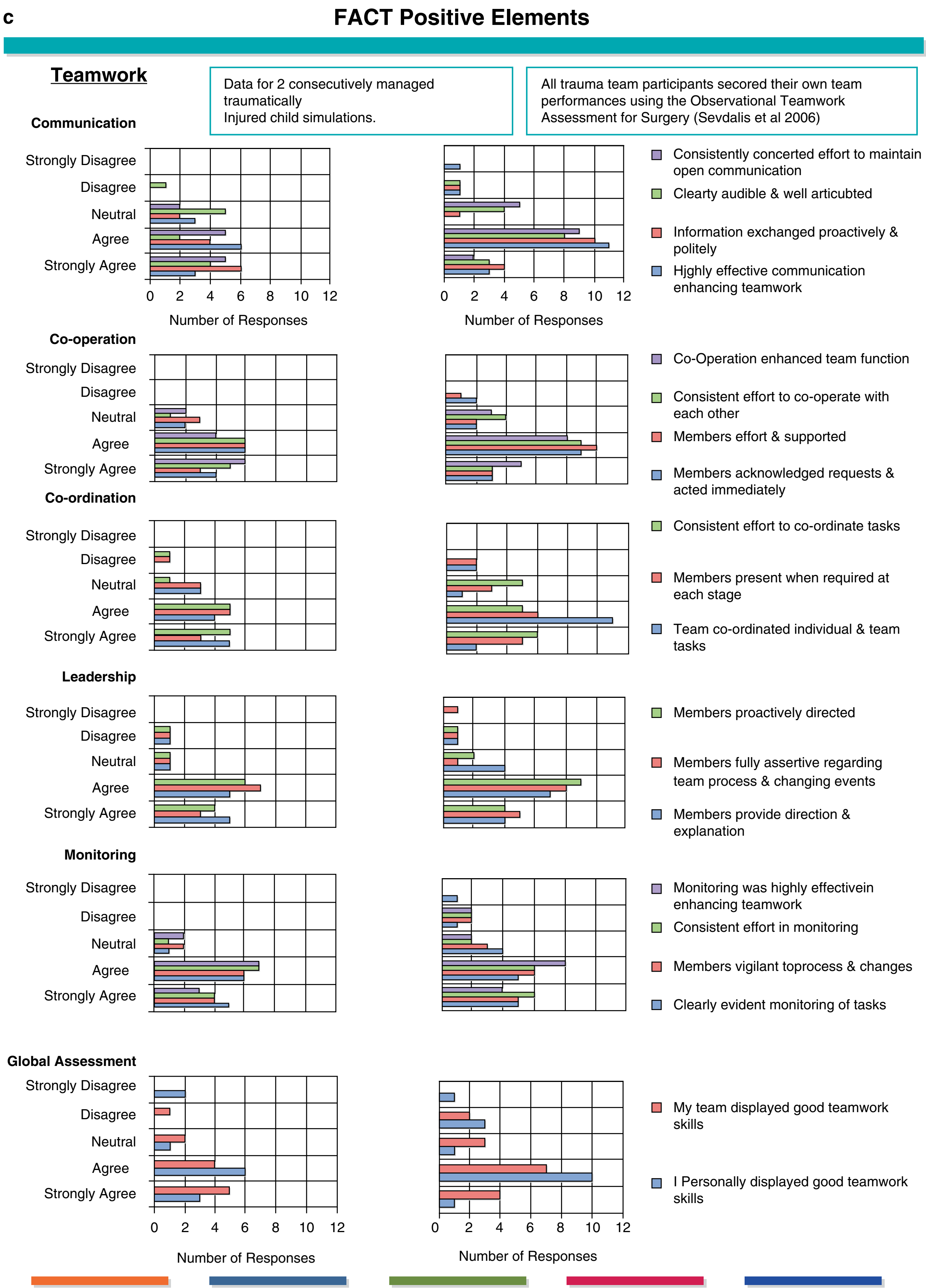


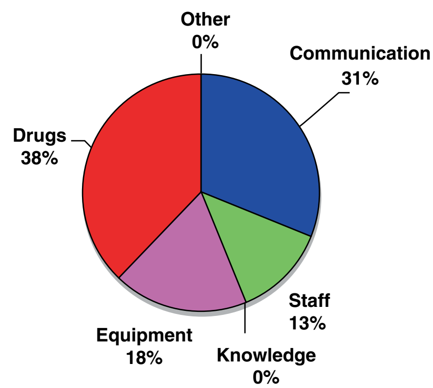
Fig. 24.5c Continued

d

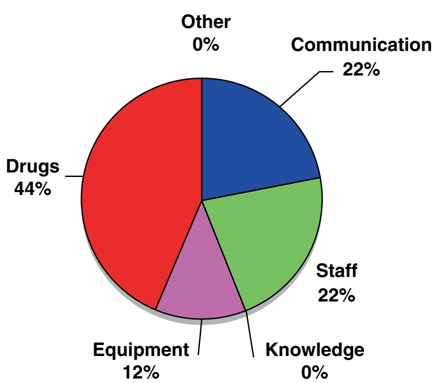
FACT Delta Elements

Comments Elements of team-hospital interaction identified by team members as factors that could improve care provision.

Child 1 Delta Elements



Child 2 Delta Elements



Categories	Sub-categories	Frequency of comments-managing child 1	Frequency of comments-managing child 2
Communication	Within team members present	1	2
	Out-within team members present	0	0
	Switchboard communication	4	0
	Information - giving	0	0
Staff	Identification of roles	0	1
	Did not attend	1	0
	Insufficient numbers	1	0
	Too many attendees	0	1
	Delay in arrival	0	0
Knowledge	Clinical	0	0
	Equipment	0	0
Equipment	Absent	1	0
	Defective	1	0
	Delay	0	0
	Unfamiliarity	1	1
	Suggestion	0	0
Drugs	Delay in drawing up / checking	6	4
	Unavailable	0	0
	Unknown drug or dosage	0	0
	Location	0	0
Other	Corridor obstruction	0	0
	No check-in	0	0

Risk **Comments** Delta elements linked to standard risk matrix of Untoward Incident Levels of research base hospital.

Child 1 Team's feedback (one commenttype per person)	Incident Leval
"switchboard told me there was no paediatric trauma team" "Bleeped to attend as matemity anaesthetist" "Switchboard unsure abouta paediatric trauma call"	Major
"called urgently to emergency room – not called to paeds trauma"	Minor
"batteries did not work for laryngoscope blade" "paeds trolley lacked masks and circuit"	Moderate
"no orthopaedic attendance"	Low
"Intubation signif. delayed no access to cupboard & fridge "weren't able to find drugkeys" "did not know who had drugkeys "difficult to find drugs and equipment to draw up drugs" "nurse as signed to prepare anae sthetic drugs struggled" "ICU nurse would beuseful for RSI drugs/procedure"	Moderate
"not been shown where equipment was so difficult to find"	Low
"critical care consultant dealing with another case"	Low

Child 2 Team's feedback (one comment type per person)	Incident Level
"not enough room for all the bodies"	Minor
"long delay in obtaining crashcall protocols and infusions" "crashcall online calculator slow to access" "clear problem with access to crashcall.net"	Moderate
"A&E bleep was not activated by switchboard" "did not know who was who" "did not know where equipment was"	Low
"blood could have arrived earlier"	Moderate
"delay in asking for blood gas to get Haemoglobin level"	Low

Fig. 24.5d Continued

are clearly defined, the best mechanisms to obtain these goals can then be identified. These include online education, procedural task trainers, and in situ, mobile, or center-based simulation programs. The investigation of remote mechanisms to facilitate and debrief procedural and interprofessional training and the evolving collaborations between institutions across regions and countries are striving to make these resources available for all those who care for infants and children and who strive to deliver safe, high-quality care whenever and wherever it is required.

Moving forward, simulation has a key role to play in both better preparation of the healthcare facilities and systems and training to/maintaining excellent performance of the healthcare providers (including paramedics, emergency medical service personnel, physicians, nurses, and allied health professionals). Accepting the stance that the stabilization of a critically unwell child is a complex interplay between a team of providers and the healthcare facility they are in, one can postulate that the needs of both the healthcare provider and facility are symbiotic. To improve patient care, the rural healthcare system needs the participants, and vice versa. A future direction of simulation may be to explore how learning best occurs in the rural setting, how this learning is best disseminated (whether horizontally across all potential team members and/or vertically through the health facility governance tree), and how patient care is impacted.

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