Research Paper

Evaluating a surgeon led training program: Targeting kidney disease in Vietnam


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ABSTRACT

Background: An educational program consisted of lectures and simulation training designed to provide knowledge and skills to improve the delivery of care to patients with kidney disease was delivered in Hue, Vietnam. A follow-up study to validate the efficacy and durability of the education and training was done one year later.

Methods: The course was validated using Kirkpatrick's four levels of evaluation: (i) pre- and post-course interviews reflecting initial reaction; (ii) training quality assessment on simulated scenarios; and (iii) follow-up questionnaires, interviews, and on-site observation of clinical care delivery.

Results: Reaction to the course was uniformly positive. Multidisciplinary design and emphasis was rated highly. The combination of evidence-based didactics and simulation training provided an assessment of application of learned material. Structured debriefing demonstrated a high degree of understanding. Predicted language and cultural barriers were reduced using simulation. Follow-up identified that course material had been put into practice, including communication, crew resource management, and a systems approach to the management of complications. Observation of clinical care identified systems changes that improved ability to deliver care in a cost-effective manner.

Conclusions: The curriculum improved multidisciplinary team performance in the short and long term. Course design provided a structured training framework, and enhanced the learning. The methods used to deliver the educational material and simulation training overcame potential language and cultural barriers. Follow-up demonstrated a sustained acceptance and application of the training in the care of complex kidney disease patients. The Kirkpatrick evaluation method assisted in determining the effectiveness of this training methodology. Using this platform for education and training can foster improvements in patient outcomes effectiveness.

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1. Introduction

There is an increasing awareness that surgical care is an important component of global health. Over the last several decades, the worldwide burden of disease has been shifting away from communicable illness toward chronic disease, injuries, and cancer [1,2]. However, attention and funding for global health has traditionally been primarily directed to combat infectious diseases, such as AIDS, malaria, and smallpox [3]. The role of surgeons is often overlooked on the global stage, which Dr. Paul Farmer has dubbed it the “neglected stepchild of global health.” [3] Today, only 3.5% of surgical procedures are performed for the poorest one third of the world’s populace, and otherwise minor surgical conditions will often progress to incapacitating illness and death [4]. Most often, global surgical efforts have been provided by teams from developed countries performing procedures over a specific time period. While this episodic care has helped many people, it is not usually sustainable by the local healthcare community. To be durable and sustainable, strategies to improve the capacity of the local healthcare infrastructure need to be developed and implemented. Furthermore, complex, chronic disease care, especially that involving surgery, requires extensive collaboration and participation with the local population and responsible government agencies in order to be effective components of a global health strategy [5,6].

One example of a chronic condition that is increasing in many areas of the world is end stage renal disease (ESRD). Treating patients with ESRD imposes significant financial burdens and logistic challenges on healthcare infrastructure. The complexity and cost of providing ESRD care are increased by the need for procedural services. Treatment of patients with kidney disease is inherently complex, and requires significant training, infrastructure, and coordination between many different members of the healthcare team.
A strategy to improve the availability of complex, surgical healthcare is to provide education and training designed to enhance outcomes effectiveness. High reliability industries such as airline transportation and petroleum have witnessed success in applying safety - outcomes focused education and training as a routine worldwide. In 2012, a scholarship was awarded to one of the authors (DPS) from the Vietnam Education Foundation (VEF) to develop and provide an education and training course designed to improve the care and outcomes of patients with kidney disease, from diagnosis to treatment including surgical management. We previously published a report highlighting the details of the program [7]. In brief, the program involved education and simulation training of healthcare teams treating patients with kidney disease in Vietnam. The course material included evidence based information and technical training, provided within a structure that emphasized human factors and crew resource management (CRM) concepts. The goal was to provide the information and training necessary to improve the system of care, thereby creating lasting improvements in patient outcomes.

In this paper, we discuss the ability of this collaborative education and team-training project to provide a sustainable positive impact on patient outcomes and on the effectiveness of surgical healthcare.

2. Methods

Beginning in 2012, education and simulation training was provided to teams (physicians, surgeons, and nurses) caring for patients with chronic kidney disease in Vietnam. The curriculum of the course included lectures (given both on site at the Hue University of Medicine and Pharmacy and by live interactive internet sessions) and on-site simulation-based team training [7]. A list of lecture topics is given in Table 1A and B. The course material focused on improving patient safety, efficiency and outcomes of care. Special attention was given to incorporating human factors and CRM into the patient care delivery system. The curriculum was designed with sensitivity to the clinical realities of providing patient care in Vietnam and to the social and cultural norms existing in the healthcare delivery system there. The total course duration was six months.

At the beginning of the course there were 35 students chosen by the leadership of the Hue Medical School. These included 6 faculty, and 29 residents. By the final simulation-training day there were 132. Of the 132, 34 were faculty (nephrology and surgery), 42 were residents and fellows, 30 were nurses, and 26 were medical students. Participants in the education and training program included practicing surgeons and medical specialist, resident and fellow level trainees, and nurses.

Course evaluation was done continuously beginning with an initial needs assessment, pre- and post-tests, and self-assessment by learners. The course lasted 6 months. In depth follow-up was done 10 months after the course ended to evaluate the impact and effectiveness of the education and training. The final course evaluation was done by direct observation, semi-structured interviews, and questionnaires. The Kirkpatrick four-level model (Reaction, Learning, Behavior, and Results) was used to quantify the effectiveness of the education and training [8–10].

In brief, the four Kirkpatrick model levels can be described as follows: Level one, reaction, is defined as what the participants thought of the particular program, including materials, instructors, facilities, methodology and content. Level two, learning, measures the learners’ acquisition of knowledge principles, facts, techniques and skills presented during the course. Level three, behavior, can be thought of as the impact of training on students’ performance on the job. Level four, results, is the ultimate outcome measure, and assesses the impact of changes in the operational performance and organizational behavior attributable to the educational program.

3. Results

The participants enrolled in the course were selected by the administration of Hue University School of Medicine and Pharmacy. The needs assessment was performed onsite, and involved both semi-structured interviews with stakeholders providing patient care as well as direct observation of daily patient care activities. The needs assessment was essential to the development of a curriculum that was relevant and met the needs and expectations of the participants. Additionally, the on-site needs assessment ensured that the realities of the existing patient care system were integrated into the educational program. The course and written materials were delivered in English. Teaching assistants with fluency in English were identified during the needs assessment phase and helped to insure all learners understood the course material.

Level one, reaction: The student reaction to the educational program was uniformly positive. In fact, the number of learners increased spontaneously over time based on word of mouth and professional networking. Designing the live Internet sessions to be available to anyone having the URL facilitated increased participation. The lectures were recorded and made available on the web for improved access and for subsequent review.

The results of a questionnaire designed to evaluate the learner reaction to the course are shown in Table 2. The mean student response indicated a high degree of satisfaction with course design and content.

Level 2, learning was measured in two ways. A final written examination was given to the 35 students who participated in the entire course via email that consisted of patient case examples, and emphasized team-based systems of patient care delivery. The students were asked to write patient care management plans (in
English) that incorporated optimizing outcomes and cost-effectiveness. The lead author (DPS) evaluated responses using the defined objectives of the course. In 63% (22/35) of the care plans, CRM skills were specifically included, emphasizing communication and protocols confirmed by checklist as part of quality improvement care. The patient care management plans developed by the students demonstrated a very good understanding of course material and an ability to apply concepts learned to complex patient care situations. Second, during the simulation sessions, authors DPS and ID, using a list of skill station objectives, evaluated students. There were five skills stations: (1) ultrasound use for vein mapping of the arm and neck, (2) ultrasound guided placement of central venous catheters, (3) consenting a patient for a procedure, (4) using checklists, and (5) discussing bad news with a patient family and other healthcare workers. The students showed tremendous enthusiasm for the skill sessions. Skill station competency was defined as the ability to verbalize and complete the principle tasks listed for each skill station. An example of the task list for ultrasound guided central venous catheter placement is provided in Table 3.

**Table 3**

<table>
<thead>
<tr>
<th>Central line placement checklist.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Discuss indications for CVL.</td>
</tr>
<tr>
<td>2. Discuss potential contraindications.</td>
</tr>
<tr>
<td>3. Discuss procedure with simulated patient, consent.</td>
</tr>
<tr>
<td>4. Learner chooses site, explains reason for site selection.</td>
</tr>
<tr>
<td>5. Ultrasound of neck.</td>
</tr>
<tr>
<td>6. Identifies major vascular structures correctly.</td>
</tr>
<tr>
<td>7. Cleans hands.</td>
</tr>
<tr>
<td>8. Prep procedure site.</td>
</tr>
<tr>
<td>9. Appropriate draping of site.</td>
</tr>
<tr>
<td>10. Appropriate sterile technique – gloves, etc.</td>
</tr>
<tr>
<td>11. Demonstrates use of ultrasound in sterile field.</td>
</tr>
<tr>
<td>12. Appropriate use of assistant, including communication.</td>
</tr>
<tr>
<td>13. Appropriate sterile dressing applied.</td>
</tr>
<tr>
<td>15. Able to discuss management of complications, emphasis on pneumothorax.</td>
</tr>
</tbody>
</table>

The most striking results were observed in Da Nang where the team had significantly increased the number of ESRD patients they are able to care for. The Da Nang dialysis unit in the central hospital serves a city of 1 million population. The course participants stated that by using strategies they had learned to improve efficiencies, they are now able to evaluate and begin renal replacement therapy for approximately twice as many new dialysis patients per month (7 vs. 14), although this could not be independently verified. The dialysis team identified improved communication between staff and with patients as a significant improvement. In addition, they are now using more standardized protocols to improve treatment consistency and reliability, and are considering adding kidney transplantation to their treatment capabilities.

### 4. Discussion

The objective of the course was to provide a curriculum that would assist physicians to improve the system of care of patients with chronic kidney disease and sustain that improvement. In Vietnam, the incidence of end stage renal disease (ESRD) is reported as high as 680 per million, nearly twice that of the United States [9,10]. However, despite the high frequency, some patients in Vietnam, as in other developing countries, do not have consistent access to treatments such as dialysis because of the complexity and expense [11]. To optimize outcomes effectiveness given fixed or limited resources, enhancing operational effectiveness is of paramount importance. To accomplish this goal, the course provided evidence-based information to enhance the understanding of methods used to treat ESRD patients coupled with human factors (CRM) concepts to improve the reliability of patient care by optimizing the timing of providing the care and proactively managing the medical, surgical, pharmacology and other complications that may occur. The use of simulation and team training to practice and to reinforce the information and techniques taught, strengthened the engagement and enthusiasm of the learners.

Although the concept of combining traditional didactic medical education with simulation and team training is still relatively novel in healthcare, the technique is gaining interest, and medical educators are publishing more on the subject [12–15]. There are at least three existing surgically related training programs that have been successful in providing education and team training – Pre-Hospital Trauma Life Support (PHTLS), Advance Trauma Life Support (ATLS), and Care for the Critically Ill Surgical Patient (CCrISP). As with the

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**Table 2**

Course evaluation results summary.

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean score (Lichert scale 1–10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were the learning objectives of the course met?</td>
<td>7.23</td>
</tr>
<tr>
<td>Were Dr Slakey’s visits to Vietnam helpful in reinforcing the course material?</td>
<td>7.6</td>
</tr>
<tr>
<td>Were the live Internet lectures easy to follow and understand?</td>
<td>7.52</td>
</tr>
<tr>
<td>Did the Internet lectures provide information that will help you take care of patients?</td>
<td>7.76</td>
</tr>
<tr>
<td>Did you view the recorded lectures?</td>
<td>7.83</td>
</tr>
<tr>
<td>Did you find the recorded lessons helpful?</td>
<td>7.74</td>
</tr>
<tr>
<td>Did you find the midterm and final questions to be relevant to the course material?</td>
<td>7.46</td>
</tr>
<tr>
<td>Did the simulation sessions improve your understanding of the course material?</td>
<td>7.63</td>
</tr>
<tr>
<td>Did the simulation sessions allow you to practice what you had learned within the course?</td>
<td>7.56</td>
</tr>
<tr>
<td>Did the course help you understand the importance of human factors and team training?</td>
<td>7.59</td>
</tr>
<tr>
<td>Do you plan to use the information from the course in your treatment of patients?</td>
<td>7.56</td>
</tr>
<tr>
<td>Do you plan to continue to use and teach others about human factors and team training?</td>
<td>7.74</td>
</tr>
<tr>
<td>Do you have a better understanding of patient safety and health care outcomes after completing this course?</td>
<td>7.23</td>
</tr>
</tbody>
</table>
design of these three courses, our curriculum incorporated CRM training so that the learners would have an increased ability to apply the knowledge and training to the system of care as opposed to just increasing individual knowledge [16–18]. The course curriculum, both didactic and simulation-based, emphasized the concept that optimal care of the ESRD patient requires a team and that team function is optimized by effective communication and systems of care.

As the curriculum was developed, the potential challenges of including CRM, especially training to improve communication, were considered and addressed. Throughout the course, the learners enthusiastically embraced the CRM concepts that were taught. Learners consistently identified the incorporation of training in CRM techniques as strength of the course. In follow-up, several physicians provided examples of how to use CRM techniques; they have been able to make team approaches to patient care more consistent and effective.

There were several aspects of the course experience that are important for future application. First, the language barrier was less significant than we thought it would be. We had the advantage of young physicians, identified by the senior leadership of Hue University to help with translation. Live Internet lectures were popular. While learners could ask questions verbally during the live lecture, we found typed questions to be more effective by avoiding difficulty in talking over others and potential embarrassment by learners not fluent in English. The ability to respond to typed questions during the live Internet sessions enhanced effectiveness of curriculum delivery and engaged the learners, especially because all system users could see the question in real time and consider the answer given by the instructor verbally. Typed questions were also easy to catalog and review at a later time.

The simulation sessions were very popular and attracted additional students not initially identified as participants, more than tripling the class size. The students were enthusiastic, learned the techniques rapidly, and were able to demonstrate understanding and application of the defined objectives. Of particular interest were the two simulations that involved communication. The ability to witness the acceptance and application of CRM communication skills and techniques by the students was remarkable. Not only did the students demonstrate competency in the communication skills, but they also embraced the idea that improved communication with patients and families would improve outcomes, making care patient centric.

The cost of the course was primarily paid for by a generous scholarship awarded to one of the authors (DPS) by the Vietnam Education Foundation. These funds, totaling $46,275 (US), were used for computer and communication equipment, course development expenses, and durable simulation equipment and travel expenses. Instructors donated their time. In addition, two corporations, Covidien and Fujifilm SonoSite, Inc., donated personnel time and equipment. The personnel of Hue University of Medicine and Pharmacy generously provided logistic support and classroom space.

The effectiveness of the course as evaluated and quantified using the Kirkpatrick four-level method was high. Using the Kirkpatrick method is useful in that it provides fundamental information about the effectiveness of this type of course. Given the potential language and cultural barriers to effective learning, a commitment to determining Kirkpatrick Levels 1 and 2, reaction and learning, during the course allowed for adjustments to the curriculum and pace as needed. The learners were enthusiastic about the structure of the course, the content, and the teaching methods. In the end, being able to observe and document Levels 3 and 4 change (actual student performance and behavioral/systems changes, respectively) strengthened the concept that collaborative education and training efforts can impact healthcare delivery.

Some problems did exist during the course. Learner participation was not consistent. Perhaps this is inevitable given the realities of workload and environment and distance. Strategies to improve consistency include greater involvement of local faculty. As discussed by others, this type of international education and training requires continued collaboration, time and trust [19,20]. Another potential shortcoming of our evaluation is inherent bias of the evaluators of learner performance in actual patient care settings, because they were also the developers of the course. Independent verification of improvements in behavior and patient care is a future goal of such educational programs. The development of a tool to assess learner competence and the integration of knowledge and skills into routine practice will be necessary to standardize future courses.

The enthusiasm for this course was evident not only by the evaluation results, but also by the increase in the number of learners during the 6-month course duration. While certainly cultural and language barriers did exist, these were less of a problem than expected, largely due to the early integration of teaching assistants from Hue University of Medicine. At its core, this project had the relationship between academic institutions, and this provided alignment based upon mission, a potential advantage describe by others [19,21].

5. Future directions

The results of this experience with education and simulation-based training confirm that this approach can produce meaningful and sustainable improvement in the ability to deliver care in a manner that maintains sensitivity to the cultural, social and economic realities of the local healthcare environment. We believe that the design of this course can serve as a platform for curricula that can be customized to meet the needs and requirements of almost any specialty or patient care area. Using education and training to improve outcomes effectiveness of international patient care systems is ideal as the concept emphasizes the local healthcare community as opposed to relying upon recurrent visits by foreign “experts.” Patient care that includes surgery in the treatment algorithm is perfectly suited to this educational and training structure because of the quality, safety, cost, and outcomes effectiveness implications.

Although the concept of improving healthcare through education and training may be ideal, there are two significant barriers to more widespread acceptance: the challenge to prove curricular effectiveness and the fiscal challenge – determining how to pay for it. This type of training is easily adaptable to settings around the world. The ultimate goal is to improve outcomes effectiveness of healthcare teams, expanding the ability to care for diseases that include surgical care. To accomplish this longer follow periods that include patient outcome data will be necessary. We believe that gathering evidence based on the Kirkpatrick model worked well to provide both short and long-term evaluation of this course and can be used for future courses [22]. An answer to the question, “Who will pay for it?” is more difficult. Perhaps with greater understanding of the merits, effectiveness, learner acceptance, and sustainability of education and simulation-based education, the international healthcare community and related funding agencies will increase the support and funding for courses and programs such as this one.

Ethical Approval

This research was exempt from registration requirements.

Funding

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Author Contribution

Douglas Slakey: Study design, course design and delivery, data collection and analysis.

Ingemar Davidson: course design and delivery

Robert Reily: manuscript editing.

James Korndorffer: course design, data analysis, editing.

Conflict of interest statement

None.

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