Published in final edited form as:

Burns. 2012 September ; 38(6): 783–789. doi:10.1016/j.burns.2012.01.012.

Three Components of Education in Burn Care: Surgical Education, Inter-professional Education, and Mentorship

Shahriar Shahrokhi, MD FRCSC FACS*, Kunaal Jindal, MD*, and Marc G Jeschke, MD PhD FACS FRCSC

Sunnybrook Health Sciences Centre, Department of Surgery, Division of Plastic and Reconstructive Surgery, University of Toronto, Toronto, Canada

Abstract

Education in burn care can be broken down into three main components: surgical education, inter-professional education, e.g. critical care education and mentorship. To date these components have been used in varying degrees in most health institutions and to even lesser extent in burn care. The aim of this paper is to highlight each component and how they have been utilised in other fields to develop teams and foster education, and how they can be translated for burn teams. These ideas are not novel; however, this paper will aim to shed light on how these concepts can be implemented in burn care, thus not only improving education, but also enabling recruitment and retention of health care providers in this field.

Keywords

education; burn; surgery

Introduction

With almost every burn center struggling to find and retain burn care providers, we believe that education, fostering, and mentoring are central elements to secure future burn care. Education in burn care can be broken down into three main components: surgical education, inter-professional education, and mentorship. The aim of this paper is to highlight these components in order to provide a framework for current trends and the future of education in the field of burn care. While these ideas are not novel and have been successfully implemented in other fields, we hypothesize that the existing knowledge can and should be implemented in burn care, not only improving education, but also enabling recruitment and retention of health care providers in this field.

© 2012 Elsevier Ltd and ISBI. All rights reserved.

Corresponding author: Marc G. Jeschke, MD, PhD, Associate Professor Sunnybrook Health Sciences Centre; Department of Surgery, Division of Plastic Surgery, University of Toronto, 2075 Bayview Avenue, Rm D704, Toronto, ON CANADA M4N 3M5 Tel: 416-480-6703; Fax: 416-480-6763; marc.jeschke@sunnybrook.ca.

*Authors contributed equally to this work.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Disclosure Summary: The authors have nothing to disclose.

Conflict of interest statement

Authors declare no conflicts of interest.

Surgical Education

Historically, the traditional method of educating a resident in the practice of surgery has been centered on the hospital-based, apprenticeship model, initially described by William Halsted over 100 years ago [1]. Skill acquisition has been reliant on observation, assisting and subsequently performing the task [2]. This is what many residents have come to understand as the classic “see one, do one, teach one” mentality. Within this template, residents learn principles and gain experience while caring for real patients, and are given increasing amounts of responsibility to prepare them to practice independently. The skills and knowledge acquired during their training is contingent on exposure to the disease conditions and the procedures encountered by their faculty, rather than the needs of the curriculum [3]. Given the varied patient population and practice patterns of each program, experience based training in surgery does not ensure standardization of skills [4].

Scrutiny of the conventional framework has caused a significant “paradigm shift” towards a more objective standardized approach to education. With the progression of technology in surgery, patient safety and medical error have created a demand for innovation in surgical education [5]. Attendance by way of case logs insufficiently comments on surgical competence [6]. The institution of work hour restrictions has had a varied affect on operative experience and surgical skill procurement dependent on surgical specialty [7]. Over the past decade, efforts to address these issues have been successful in augmenting Halsted's original ideals. To enrich the education of the trainees in our burn care program we have implemented competency based rotation goals and objectives, web-based learning and as well as extensive use of surgical skills laboratory to enhance their technical skills. This shifting dynamic of surgical education is both challenging and exciting for residents and educators alike, as it provides the foundation to alter the future of this craft.

Simulation

The learning curve associated with new procedures carries inherent patient morbidity, as they require a level of technical skill and confidence normally gained through practice [8]. For example, the donor site morbidity of an improperly harvested split thickness skin graft is significant, especially if a second site is eventually required. Simulators are an objective and reproducible medium that can allow technology to ease the transition from beginner to expert, while standardizing education, decreasing costs, reducing patient risk and improving outcomes [4]. The efficacy of simulators has been reported in the literature [9], and their widespread application is seen in General Surgery [10], Urology [11], Gynaecology [12] and endoscopy [13]. Increasing prevalence of simulation in medical training has prompted the Accreditation Council for Graduate Medical Education (ACGME) and the American College of Surgeons (ACS), to implement a phased approach to formally require their use in surgical education.

The advent of simulators has forged a new era of excellence in surgery. The low-stress environment alleviates the anxiety of the operating room and enhances resident learning, while allowing for mistakes and improvement without compromising patient care [2]. The skills gained in this practical learning atmosphere have been proven to enrich performance in live operative models and therefore, can be transferable to the operating room [14]. The concept that “physical and mental skills are learned through a long process of persistent and dedicated efforts with repetition to reinforce the activity” [2], is fundamental to the development of a successful surgeon. Fitts and Posner [15] described the 3 stages of skill acquisition in 1967. The student must first intellectualize the process, second develop the proper motor behaviour, and third subsequent repetition gradually results in smooth performance through muscle memory. The notion of ‘practice before the game’ holds true

for musicians and athletes, and similarly, simulation has been shown to be effective in surgical motor skill acquisition [16].

Time is the key challenge faced by most programs establishing a skills lab. Resident workload and responsibility is demanding and often prohibits dedication to practice. Similarly, the commitments of academic faculty, limits their time to supervise and provide necessary feedback. In order for a skills curriculum to achieve optimal results, sufficient time allocation is imperative. Simulation training is a pivotal tool in surgical education, which should be adopted into the armamentarium of any residency program.

Although the use of simulation in burn surgical training is limited (STSG models), there is great educational potential for its utilization, especially in the resuscitation and critical care aspect of burn care.

Education in the Internet Era

The evolution of the World Wide Web has become one of the most important accomplishments in history. It has revolutionized the dissemination of information and the propagation of knowledge. Over 220 million people (73%) in the United States use the Internet [5] for the purposes of education, research, business, news and entertainment. The Internet possesses an incredible opportunity for the growth of surgical education, and to overcome several of its current challenges. The widespread availability of online materials has permitted the shift of education away from the operating room. The issues of time constraints, patient safety and geographical limitations have been greatly attenuated with the initiation of web-based learning. The Internet has also facilitated the development of global collaboration of medical education [5].

Currently, e-learning has been successfully integrated into surgical programs for instruction in areas including anatomy [17], course curriculum [18], procedural skills [19] and problem-based learning [20]. There are endless implementation strategies to supplement training. Individual programs can dictate the published content they wish to provide, ranging from links to journal articles and seminars, to modules and videos [5]. Online simulators are also becoming ubiquitous, creating a reusable, accurate and self-directed model for the accession of knowledge and skills.

The authors acknowledge that e-learning modules in burn care are currently available, however, there would be great benefit in the development of universal web-based/e-learning modules for burn care. The authors would suggest that there should be one standardised and accepted resource for education of all trainees and continuing education of the professionals already engaged in the care of the thermally injured patient. The development of such curriculum can be undertaken by any of the committees for education in either the American Burn Association or International Society for Burn Injury or better yet can be done jointly.

Rotations as Courses

In Halsted's model of surgical education, each rotation served as the primary route by which residents built their knowledge base. At the conclusion of a given rotation an attending staff awards a pass, which inadequately examines the resident's mastery of clinical and intellectual content, and their ability to function autonomously [21] current teaching system must place greater accountability on the resident by formally assessing their attainment of objectives throughout residency. This approach will increase resident motivation in developing superior study habits while keeping abreast of pertinent topics. Qualifying and certification exam results have been shown to improve with weekly assigned readings and exams [22]. In a study by Maddaus et al [21], rotations were restructured as courses with learning objectives, pre-tests, post-tests and oral exams, has revealed favourable preliminary

results. Reorganizing burn rotations into discrete courses would be advantageous and beneficial by putting greater responsibility and liability on the resident. These course could focus on resuscitation, ventilation, infection, surgical knowledge, and wound healing.

Web-based learning in the form of designated modules is a promising resource with growing potential that must be considered in the development of a burn curriculum. It is however, important to view it as an augment to an educational program, unable to replace formalized teaching [5].

Mentorship

Mentoring relationships have been well established as an essential element for achieving growth and success in business, politics and academia [23]. Within the healthcare system, although mentorship has clearly had a positive impact in nursing [24,25], the literature in surgical training is limited. It is designed to provide support, encouragement and professional vision [26], and has been described as crucial in surgical training [27] and influential in career path selection [28]. Faculty members who were mentored have more confidence, more productive research endeavours and greater career satisfaction [29-31], while a lack of mentoring is considered an important factor hindering career progress in academic medicine [32].

Peer Mentorship

Peer mentoring is defined as a relationship in which mentors and mentees are similar in professional status and they help each other and themselves through teaching and collaborative learning [33]. This model provides support in a non-evaluative environment [34], while promoting collegiality and a nurturing climate for personal and vocational growth [25]. It has been successfully applied in nursing, resulting in a less stressful and more comfortable environment [35,36]. Students report increased self-confidence and social integration, mitigating much of the initial anxiety associated with a new rotation [25]. Mentors enjoy the satisfaction of service while honing their interpersonal and communication skills [37]. These skills are of paramount importance in the burn care, which requires a true team to care for these patients.

Hierarchical Mentorship

The classical model of mentorship involves a pupil learning skills and knowledge from a preceptor or established expert in the field. This allows for the transference of experience from one generation to the next. In addition to the obvious advantages to the resident, hierarchical mentoring encompasses many benefits for the staff. Mentors develop a sense of pride and privilege in fulfilling their role of shaping the successors of their field. Medicine is the pursuit of lifelong learning, and mentorship programs give the 'lions' a chance to learn from the 'cubs' in an effort to retool themselves in this progressively changing environment. This mutually beneficial relationship has also been shown to increase faculty retention [38]. Establishment of formal mentorship program in burn care is essential for maintain a positive work environment, enhancing professional satisfaction and thus ensuring the future of the profession.

What is a Mentor

A mentor is a trusted educator whose role extends far beyond the teaching of technical skills and clinical judgment in the clinics, operating room and on the wards. They are role models who provide direction and instil values, while demonstrating effective communication, time management and successful prioritization of multiple personal and professional commitments [39]. The relationship is dynamic and adapts over time to meet the needs of

the mentee [40]. Although support is the primary principle, mentees need to be challenged and given both positive and negative feedback to enable professional development [41]. Successful execution of this role requires many important qualities that a mentor must possess. Competence, confidence and commitment are 3 essential attributes vital to knowledgeable mentors who are respected in their field [42].

The ingredients that produce an outstanding mentor are rarely innate. "Mentorship has been a casually acquired trait with varying levels of success, but it is clear that the face of medicine and surgical training in the 21st century requires deliberate cultivation of mentors" [39]. It would be beneficial to implement staff development programs, highlighting effective mentoring skills and mentor responsibilities [38].

Implementation

Although informal mentoring occurs in the daily interactions with more senior surgeons, formal mentorship programs increase satisfaction and efficacy [27]. The success of the mentor relationship is significantly higher when mentees select their own mentors [27,43]. Role preparation of both sides ensures a smooth introduction, as mentors need training, and mentees need objectives and reasonable expectations [24]. As with any new relationship, adequate meeting time is compulsory for the development of a trusting and fruitful alliance.

Mentorship primarily occurs because mentors consider it a rewarding feature of their profession. Increasing demands on faculty time and the current criteria for academic advancement have seriously threatened the future of mentorship. Scholarship over citizenship is currently the gauge for promotion in surgery; thus, mentoring descends to a lower priority being largely uncompensated and undervalued [31]. There is a need for novel ideas to enhance faculty participation in this cornerstone of surgical training. Institutional recognition and appreciation of mentors and publicly rewarding mentorship excellence will increase the prestige of the activity and faculty enrolment. Mentorship can also be adapted into the faculty evaluation process for promotion [31].

"Mentoring is a vital cog in the machinery of medical education" [41] and should be incorporated into burn curricula.

Inter-professional Education

In medicine, physicians are largely educated in isolation of other health professionals, resulting in limited collaboration, communication and coordination of care [44]. Many surgeons have been educated in a culture that places value on individual accomplishments; however, the importance of teamwork in medicine is becoming increasingly evident in the delivery of quality care and reduction of medical errors [45-50]. In complex care settings like burn units, a single health care professional is not equipped to handle the diversity of their patients' needs. A strong, coherent team approach in a burn unit reduces mortality, shortens length of stay and improves rehabilitation [51]. The relationship with other health care professionals has become an emphasis of modern surgical professionalism [52].

What is Inter-professional Education

Health Canada defines inter-professional education (IPE) as "socializing health care providers in working together, in shared problem solving and decision making, towards enhancing the benefits for patients; developing mutual understanding of, and respect for, the contributions of various disciplines; and instilling the requisite competencies for collaborative practice." The Centre for the Advancement of Inter-professional Education (CAIPE) similarly refers to IPE as instances when "two or more professions learn from and about each other to improve collaboration and the quality of care" [53]. IPE is a unique

approach to learning, where knowledge is attained through social collaboration with other professions, and the learning process is equally as important as the content itself [44]. It improves the understanding of team member complementary skills and increases mutual accountability. The contact between professions is insufficient to build the communication, respect and trust necessary for effective team performance [54]. Learning ‘as’ a team, rather than simply ‘in’ a team, enhances the collective capability [55].

Approaches to Inter-professional Education

There are numerous models to engage the members of the burn unit in interactive learning. These health professionals include students, residents, occupational therapists, physiotherapists, social workers, nurses, respiratory therapists, dieticians, intensivists, surgeons and any other specialists that are involved in the complex care of these patients. Exchange based learning can be achieved through seminars, workshop discussions and case study sessions, where members of the team can explore the realms of each other's roles in the setting of collaborative care [56]. Problem-based learning is an effective example of the action based educational approach, as the team is actively involved in working together to determine the most suitable course of action. Simulation not only has educational merit in technical skill acquisition, it is also useful in the teaching of IPE when feedback is given in small instructor led groups simulating a real situation [57]. The growth of online resources has allowed asynchronous communication to overcome collaborative time scheduling and geographic constraints, while permitting practicing health care workers to learn together [58-61]. This model has been shown to be effective in teaching IPE [62,63].

Student feedback reveals that inter-professional education, through learning outside one's disciplinary boundaries, forges mutual respect [64,65]. Inter-professional education provides the tools necessary to reduce the gaps in current practices by forming a profound comprehension of the patient care team.

In burn care, a multidisciplinary team approach is inherent in the daily care of the patient, however one must ensure that there's also designated IPE opportunities. In our institution, our weekly education rounds are attended by all members of the team and are led by various members of the multidisciplinary team (this includes members of the medical profession, nursing, respiratory therapy, occupational and physical therapy, rehab medicine, social work, nutrition, and pharmacy) in order to learn with and from one another.

Conclusions

The concepts reviewed in this article are all in use in varying degrees in most institutions; however, it is the authors' belief that to be truly successful, all the components need to be implemented in order to achieve a successful burn education program. The authors are also fully aware that to accomplish this task, there needs to be “buy in” from all team members, with a single-minded goal of educating the future burn care providers.

Acknowledgments

This study was supported by grants from the NIH (R01 GM087285), CFI, and PSI. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

References

1. Halstead WS. The training of the surgeon. *Johns Hopkins Hosp Bull.* 1904; 15:267–75.
2. Buscarini M, Stein JP. Training the urologic oncologist of the future: where are the challenges? *Urol Oncol.* 2009; 27:193–8. [PubMed: 19285233]

3. Sachdeva AK, Bell RH Jr, Britt LD, Tarpley JL, Blair PG, Tarpley MJ. National efforts to reform residency education in surgery. *Acad Med.* 2007; 82:1200–10. [PubMed: 18046129]
4. Rosen JM, Long SA, McGrath DM, Greer SE. Simulation in plastic surgery training and education: the path forward. *Plast Reconstr Surg.* 2009; 123:729–38. [PubMed: 19182636]
5. Pugh CM, Watson A, Bell RH Jr, Brasel KJ, Jackson GP, Weber SM, et al. Surgical education in the internet era. *J Surg Res.* 2009; 156:177–82. [PubMed: 19555973]
6. Miller DC, Montie JE, Faerber GJ. Evaluating the Accreditation Council on Graduate Medical Education core clinical competencies: techniques and feasibility in a urology training program. *J Urol.* 2003; 170:1312–7. [PubMed: 14501755]
7. Simien C, Holt KD, Richter TH, et al. Resident Operative Experience in General Surgery, Plastic Surgery, and Urology 5 Years after the Implementation of The ACGME Duty Hour Policy. *Ann Surg.* 2010; 252:383–389. [PubMed: 20622660]
8. Watt DA, Majumder S, Southern SJ. Simulating split-skin graft harvest. *Br J Plast Surg.* 1999; 52:329. [PubMed: 10624315]
9. Chipman JG, Schmitz CC. Using objective structured assessment of technical skills to evaluate a basic skills simulation curriculum for first-year surgical residents. *J Am Coll Surg.* 2009; 209:364–70. [PubMed: 19717041]
10. Lin E, Szomstein S, Addasi T, Galati-Burke L, Turner JW, Tiszenkel HI. Model for teaching laparoscopic colectomy to surgical residents. *Am J Surg.* 2003; 186:45–48. [PubMed: 12842748]
11. Hammond L, Ketchum J, Schwartz BF. Accreditation council on graduate medical education technical skills competency compliance: urological surgical skills. *J Am Coll Surg.* 2005; 201:454–7. [PubMed: 16125081]
12. Clevlin L, Grantcharov TP. Does box model training improve surgical dexterity and economy of movement during virtual reality laparoscopy? a randomised trial. *Acta Obstet Gynecol Scand.* 2008; 87:99–103. [PubMed: 18158634]
13. Shirai Y, Yoshida T, Shiraishi R, Okamoto T, Nakamura H, Harada T, et al. Prospective randomized study on the use of a computer-based endoscopic simulator for training in esophagogastroduodenoscopy. *J Gastroenterol Hepatol.* 2008; 23:1046–50. [PubMed: 18554236]
14. Stelzer MK, Abdel MP, Sloan MP, Gould JC. Dry lab practice leads to improved laparoscopic performance in the operating room. *J Surg Res.* 2009; 154:163–6. [PubMed: 19101694]
15. Fitts, PM.; Posner, MI. *Human Performance.* Brooks/Cole; Belmont: 1967.
16. Boehler ML, Schwind CJ, Rogers DA, Ketchum J, O'Sullivan E, Mayforth R, Quin J, Wohltman C, Johnson C, Williams RG, Dunnington G. A theory-based curriculum for enhancing surgical skillfulness. *J Am Coll Surg.* 2007; 205:492–497. [PubMed: 17765166]
17. Choi AR, Tamblyn R, Stringer MD. Electronic resources for surgical anatomy. *ANZ J Surg.* 2008; 78:1082–1091. [PubMed: 19087047]
18. Kalet AL, Coady SH, Hopkins MA, Riles TS. Preliminary evaluation of the Web Initiative for Surgical Education [WISE-MD]. *Am J Surg.* 2007; 194:89–93. [PubMed: 17560916]
19. Chenkin J, Lee S, Huynh T, Bandiera G. Procedures can be learned on the Web: a randomized study of ultrasound-guided vascular access training. *Acad Emerg Med.* 2008; 15:949–954. [PubMed: 18778380]
20. Corrigan M, Reardon M, Shields C, Redmond. "SURGENT" - student e-learning for reality: the application of interactive visual images to problem-based learning in undergraduate surgery. *J Surg Educ.* 2008; 65:120–5. [PubMed: 18439533]
21. Maddaus MA, Chipman JG, Whitson BA, Groth SS, Schmitz CC. Rotation as a course: lessons learned from developing a hybrid online/on-ground approach to general surgical resident education. *J Surg Educ.* 2008; 65:112–6. [PubMed: 18439531]
22. de Virgilio C, Chan T, Kaji A, Miller K. Weekly assigned reading and examinations during residency, ABSITE performance, and improved pass rates on the American Board of Surgery examinations. *J Surg Educ.* 2008; 65:499–503. [PubMed: 19059184]
23. Roche GR. Much ado about mentors. *Harv Bus Rev.* 1979; 1:14–31.
24. Sprengel AD, Job L. Reducing student anxiety by using clinical peer mentoring with beginning nursing students. *Nurse Educ.* 2004; 29:246–250. [PubMed: 15586121]

25. Sweet S, Fusner S. Social integration of the advanced placement LPN: a peer mentoring program. *Nurse Educ.* 2008; 33:202–205. [PubMed: 18769320]
26. Gilmour JA, Kopeikin A, Douche J. Student nurses as peer-mentors: collegiality in practice. *Nurse Educ Pract.* 2007; 7:36–43. [PubMed: 17689422]
27. Flint JH, Jahangir AA, Browner BD, Mehta S. The value of mentorship in orthopaedic surgery resident education: the residents' perspective. *J Bone Joint Surg Am.* 2009; 91:1017–22. [PubMed: 19339590]
28. McCord JH, McDonald R, Leverson G, Mahvi DM, Rikkers LF, Chen HC, et al. Motivation to pursue surgical subspecialty training: is there a gender difference? *J Am Coll Surg.* 2007; 205:698–703. [PubMed: 17964446]
29. Palepu A, Friedman RH, Barnett RC, Carr PL, Ash AS, Szalacha L, Moscovitz MA. Junior faculty members' mentoring relationships and their professional development in US medical schools. *Acad Med.* 1998; 73:318–323. [PubMed: 9526459]
30. Ramanan RA, Phillips RS, Davis RB, Silen W, Reede JY. Mentoring in medicine: keys to satisfaction. *Am J Med.* 2000; 112:336–341. [PubMed: 11893387]
31. Levy BD, Katz JT, Wolf MA, Sillman JS, Handin RI, Dzau VJ. An initiative in mentoring to promote residents' and faculty members' careers. *Acad Med.* 2004; 79:845–850. [PubMed: 15326007]
32. Jackson VA, Palepu A, Szalacha L, Caswell C, Carr PL, Inui T. "Having the right chemistry": a qualitative study of mentoring in academic medicine. *Bull Am Coll Surg.* 2008; 93:19–25.
33. Topping KJ. The effectiveness of peer tutoring in further and higher education: a typology and review of the literature. *Higher Ed.* 1996; 32:321–45.
34. Heinrich K, Scherr M. Peer mentoring for reflective teaching. *Nurse Educ.* 1994; 19:36–41. [PubMed: 7862294]
35. McKeachie, W.; Svinicki, M. Active learning: cooperative, collaborative and peer learning.. In: Sommer, S., editor. *Teaching tips: strategies, research, and theory for college and university teachers.* Houghton Mifflin Co; New York: 2006. p. 213-20.
36. Becker MK, Neuwirth JM. Teaching strategy to maximize clinical experience with beginning nursing students. *J Nurs Educ.* 2002; 41:89–91. [PubMed: 11852991]
37. Miller, A. *Mentoring students and young people.* Kogan Page Ltd; London: 2002.
38. Benson CA, Morahan PS, Sachdeva AK, Richman RC. Effective faculty preceptoring and mentoring during reorganization of an academic medical center. *Med Teach.* 2002; 24:550–7. [PubMed: 12450479]
39. Möller MG, Karamichalis J, Chokshi N, Kaafarani H, Santry HP. Mentoring the surgeon. *Bull Am Coll Surg.* 2008; 93:19–25.
40. Wensel TM. Mentor or preceptor: what is the difference? *Am J Health Syst Pharm.* 2006; 63:1597. [PubMed: 16914629]
41. Ramani S, Gruppen L, Kachur EK. Twelve tips for developing effective mentors. *Med Teach.* 2006; 28:404–8. [PubMed: 16973451]
42. Morton-Cooper, A.; Palmer, A. Mentoring in practice.. In: Morton-Cooper, A.; Palmer, A., editors. *Mentoring, preceptorship and clinical supervision.* Blackwell Science; Oxford: 2000. p. 59-62.
43. Ford HR. Mentoring, diversity, and academic surgery. *J Surg Res.* 2000; 118:1–8. [PubMed: 15093709]
44. Sargeant J. Theories to aid understanding and implementation of interprofessional education. *J Contin Educ Health Prof.* 2009; 29:178–84. [PubMed: 19728383]
45. Campbell SM, Hann M, Hacker J, Burns C, Oliver D, Thapar A, et al. Identifying predictors of high quality care in English general practice: observational study. *BMJ.* 2001; 323:784–9. [PubMed: 11588082]
46. Stevenson K, Baker R, Farooqi A, Sorrie R, Khunti K. Features of primary health care teams associated with successful quality improvement of diabetes care: a qualitative study. *Fam Pract.* 2001; 18:21–6. [PubMed: 11145623]

47. Unützer J, Katon W, Callahan CM, Williams JW Jr, Hunkeler E, Harpole L, et al. Collaborative care management of late-life depression in the primary care setting: a randomized controlled trial. *JAMA*. 2002; 288:2836–45. [PubMed: 12472325]
48. Morey JC, Simon R, Jay GD, Wears RL, Salisbury M, Dukes KA, et al. Error reduction and performance improvement in the emergency department through formal teamwork training: evaluation results of the MedTeams project. *Health Serv Res*. 2002; 37:1553–81. [PubMed: 12546286]
49. Risser DT, Rice MM, Salisbury ML, Simon R, Jay GD, Berns SD. The potential for improved teamwork to reduce medical errors in the emergency department. The MedTeams Research Consortium. *Ann Emerg*. 1999; 34:373–83. Med.
50. Reeves, S.; Zwarenstein, M.; Goldman, J.; Barr, H.; Freeth, D.; Koppel, I., et al. *Cochrane Review Cochrane Library*. Wiley; London: 2008. Interprofessional education: effects on professional practice and health care outcomes..
51. Gibran NS, Klein MB, Engrav LH, Heimbach DM. UW burn center. A model for regional delivery of burn care. *Burns*. 2005; 31:S36–9. [PubMed: 15649616]
52. Kitto SC, Gruen RL, Smith JA. Imagining a continuing interprofessional education program [CIPE] within surgical training. *J Contin Educ Health Prof*. 2009; 29:185–9. [PubMed: 19728384]
53. Centre for the Advancement of Interprofessional Education (CAIPE). Interprofessional education: a definition. CAIPE; London: 1997. Bulletin No. 13
54. Sargeant J, Loney E, Murphy G. Effective interprofessional teams: “Contact is not enough” to build a team. *J Contin Educ Health Prof*. 2008; 28:228–34. [PubMed: 19058243]
55. Barr H. An anatomy of continuing interprofessional education. *J Contin Educ Health Prof*. 2009; 29:147–50. [PubMed: 19728377]
56. Hammick M, Olckers L, Campion-Smith C. Learning in interprofessional teams: AMEE guide no 38. *Med Teach*. 2009; 31:1–12. [PubMed: 19253148]
57. Issenberg SB, Mcgaghie WC, Petrusa ER, Gordon DL, Scalese RJ. Features and uses of high-fidelity medical simulations that lead to effective learning: A BEME systematic review. *Med Teac*. 2005; 27:10–28.
58. Arias, AA.; Bellman, B. Networked collaborative research and teaching.. In: Boschmann, E., editor. *The electronic classroom: a handbook for education in the electronic environment*. Learned Information; Medford: 1995. p. 180-5.
59. Chen, LLJ.; Gaines, B. Modelling and supporting virtual cooperative interaction through the World Wide Web.. In: Sudweeks, F.; McLaughlin, M.; Rafaeli, S., editors. *Network and netplay: Virtual groups on the Internet*. AAAI Press/MIT Press; Menlo Park: 1998. p. 221-42.
60. Harasim, L.; Hiltz, SR.; Teles, L.; Turoff, M. *Learning networks: a field guide to teaching and learning online*. MIT Press; Cambridge: 1995.
61. Scardamalia, M.; Bereiter, C. Computer support for knowledge-building communities.. In: Koschmann, T., editor. *CSSL: theory and practice of an emerging paradigm*. Erlbaum; Mahwah: 1996.
62. Walsh K. Interprofessional education online: the BMJ learning experience. *J Interprof Care*. 2007; 21:691–3. [PubMed: 18038300]
63. Luke R, Solomon P, Baptiste S, Hall P, Orchard C, Rukholm E, et al. Online interprofessional health sciences education: from theory to practice. *J Contin Educ Health Prof*. 2009; 29:161–7. [PubMed: 19728380]
64. Wilcock PM, Janes G, Chambers A. Health care improvement and continuing interprofessional education: continuing interprofessional development to improve patient outcomes. *J Contin Educ Health Prof*. 2009; 29:84–90. [PubMed: 19530199]
65. Cooper H, Spencer-Dawe E, McLean E. Beginning the process of teamwork: design, implementation and evaluation of an inter-professional education intervention for first year undergraduate students. *J Interprof Care*. 2005; 19:492–508. [PubMed: 16308172]

Table1

Summary and Practice Solutions/Suggestions

Burn Education Component	Interventions and objective outcomes
Surgical Education	Competency based goals and objectives Standardized web-based / e-learning modules Surgical Skills lab (for technical skills) Simulation (for resuscitation, critical care, and technical skills)
Mentorship	Establish formal hierarchical and peer-based mentorship program Support and encourage in professional endeavours Enhance retention of professionals
Inter-professional Education	Develop education rounds led by different members of the health care team and encourage participation by all members Incorporate modules and problem based learning to learn from and with one another Enhance communication and team building