

Mentorship in surgical training: a systematic review

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Abstract

Objective This review systematically examines the literature regarding mentor–mentee relationships in surgery.

Background The usefulness of mentorship in surgical training has been expressed in many articles. However, to date, there has been no systematic review on mentoring surgical trainees. This surgical environment is different from other areas of medicine and requires young surgeons to learn skills not readily available from textbooks. Instead, mentors are a valuable mode of transferring this knowledge to the next generation of surgeons. Thus, mentorship is a worthy area of research and attention.

Methods We identified all articles discussing mentorship in surgery between January 1985 and August 2010 using PubMed and ISI Web of Knowledge. Predetermined exclusion and inclusion criteria were used to screen articles by title, abstract, and full text in sequence. We extracted the relevant data, and then analyzed the prevalence of major surgical mentoring themes in the literature.

Results Of the 1,091 unique articles found during our original literature search, 38 were selected for review. The majority (68%) were commentary/editorial articles. The most discussed themes include the desirable qualities of a surgical mentor, the structure of mentor–mentee relationships, and advice for overcoming barriers to mentoring. Much less discussed themes include the desirable traits in a mentee and the appreciation of generational and cultural differences in mentorship.

Conclusions Several barriers to effective surgical mentoring were identified, such as time constraints and a lack of female mentors. By focusing on the positive traits found in this review, for example, developing formal programs to alleviate time constraints, these barriers can be overcome and effective mentor–mentee relationships can be built. Many articles draw attention to the dying art of mentorship in surgical training programs, and currently, the literature on mentorship in surgery is somewhat scarce. These concerns should serve as motivation to revive mentorship in surgery education and to expand the literature regarding underexplored themes and overcoming the current barriers. Although mentorship may not always take on a structured form, it should not be treated casually because proper mentorship is the foundation for training quality surgeons.

Keywords Mentorship · Surgery · Systematic review

Introduction

Contemporary surgery training programs rely heavily on mentors to produce well-trained surgeons. In addition to imparting the techniques of clinical care, mentors are responsible for instructing trainees in the “vital aspects of compassion, communication, professionalism, and patient care ethics” [19]. However, as Rohrich noted in his commentary on mentoring in medicine, he is “fearful that mentoring is becoming a lost art in medicine and plastic surgery” [34]—a concern shared by many educators in all surgical specialties. Therefore, it is imperative to systematically assess the available articles regarding surgical mentorship in order to identify important themes of mentorship and to distill from the literature the essential components of surgical mentorship to advance surgical training.

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In its purest form, a mentor is a senior member of a field who guides a trainee in personal, professional, and educational matters. Surgical trainees in particular (be they residents, medical students, or junior faculty) need high-quality mentors to learn from. This is because the surgical environment is unique, defined by several distinct characteristics that set it apart from other professional settings even within the healthcare system itself. The expectations and personalities of surgical staff and attending physicians, combined with the stresses associated with the operating room, often present a challenging learning environment for surgical trainees of all disciplines. As a result, mentors have been an integral part of surgical training since William Halstead—influenced by the Socratic teaching method—incorporated them into his design for surgical education [1]. Halstead’s own mentee Harvey Cushing, who went on to found and develop the specialty of neurosurgery, exemplifies the fruitfulness of good mentorship [1]. The importance of surgical mentors is still recognized and many surgical training programs assign a faculty mentor or senior student to support and guide their less experienced colleagues.

Several factors are causing a change to the surgical environment. Current political and economic debates have targeted the practice of surgery as one of the primary causes of the rising cost in healthcare, increasing the financial constraints placed on surgeons [2, 33]. Furthermore, changes in the case mix surgeons [10], resident work hour regulations established by the Accreditation Council on Graduate Medical Education (ACGME) [27, 33, 45], and technological advances [10, 33] are rapidly changing the surgical environment, and with it, the experience that surgical trainees receive. As surgical education evolves in response to these changes and continues to move away from the Halstedian apprenticeship model of training [11, 33], it is important that surgical mentor–mentee relationships adapt as well.

Much of the available literature on mentor–mentee relationships is dedicated to the benefits of mentoring, most frequently regarding the effect of mentorship on the mentee’s career satisfaction, publication rate, and status in the medical community. The uniqueness of the surgical environment (time spent in the operating room, hours spent caring for patients and being on call, and the dedication to improving surgical techniques) necessitates an equally unique approach to these relationships [43]. However, the vast majority of this literature “is specific to internal medicine and does not extrapolate well to academic surgical practice” [4]. Sambunjak et al. recently conducted a systematic review of mentoring in academic medicine, which highlighted various aspects of mentoring relationships [35]. To date, there has been no similar inquiry to the prevalence of surgical mentoring topics.

This review systematically examines the prevalence and distribution of surgical mentoring themes in the current

literature. Specifically, we aim (1) to extract the distribution of mentoring themes discussed in current surgical mentoring literature by highlighting specific considerations for the surgical environment and (2) to expose both underexplored and overrepresented aspects of surgical mentorship themes in order to provide direction for future research and prevent duplication of studies.

Materials and Methods

Literature Search

We performed a search of the English language literature published between January 1985 until August 2010 available on PubMed and ISI Web of Knowledge to identify articles regarding mentorship in surgical training. We input all Medical Subject Headings (MeSH) variations of “mentor” and “surgery” or “operation” as search terms in both databases. Two of the authors screened the articles individually.

Inclusion and Exclusion Criteria

We removed all duplicates and screened the remaining articles by title, abstract, and full text according to the predetermined exclusion criteria, which were based on an informal review of mentoring literature (Table 1). After each screen, we discussed discrepancies and came to a final agreement for each article before moving on to the next step. Upon completion of the full-text screening step, we manually explored the references of included articles according to the same procedure. No restrictions were placed on study methods.

Telementoring and other distance or video mentoring articles were included until the abstract search, at which point we excluded them because these types of mentoring are not comparable to long-term educational mentor–mentee relationships. Telementoring is an effective method for teaching specific procedures and skills, but does not have the one-on-one commitment to which this review is focused. Other short-term forms of mentorship are used to teach new procedures

Table 1 Inclusion and exclusion criteria

Inclusion criteria	
Surgical mentoring with a professional and/or educational focus	
Peer-reviewed article, commentary/editorial	
Focus on mentoring approach, relationship, program, environment, or barriers	
Exclusion criteria	
Peer, nursing, or other nonsenior–junior surgical mentoring	
Speech, letter, biography, or tribute about a mentor	
Telementoring, video mentoring, telerobotic mentoring, or telesurgery	

(such as laparoscopic surgery techniques), but because the focus and length of these mentorships are very narrow, we chose to exclude them from this review as well.

Data Extraction

We developed a working list of important surgical mentorship themes during our informal review of the literature. Once the exclusion process was completed, we decided on 15 themes and article properties (Table 2). Some of these categories apply to all forms of mentorship and may not specifically emphasize surgery, but we felt that they are essential to surgical mentoring as well. We examined the included articles for the presence of these themes and properties, and then analyzed these data for discrepancies between the two reviewers. Discrepancies were resolved by discussion to reach a consensus. For each article included, the themes discussed within the text were tallied in a spreadsheet. The proportion of articles discussing each theme was calculated based on these tallies. Additionally, commonly occurring ideas and topics within each theme were noted for discussion within this review.

Results

Study Retrieval and Characteristics

Once nonrelevant and duplicate articles were eliminated, our search identified 1,091 articles. Following title and

Table 2 Mentorship themes and article properties

Themes
Barriers to mentorship
Cultural differences
Gender
Generational differences
Scarcity of qualified mentors
Time commitment issues
Career choice
Evaluating the relationship
Qualities of a good mentor
Qualities of a good mentee
Setup/format of mentorship program
Formal vs. informal
Length of mentorship
Stages
Properties
Article type
Biases and limitations
Surgical specialty

abstract searches, 63 citations remained. After reviewing these articles, 37 were selected to be included, and 1 more was added following a manual reference check. Figure 1 illustrates this process. Of these 38 articles, 26 were commentaries/editorials (68.4%), 10 were peer-reviewed articles utilizing surveys (26.3%), and the 2 remaining papers were review articles (5.3%) (Table 3). Of these 38 articles, 27 were directed at surgical fields in general, whereas the others gave more specific considerations regarding a particular surgical specialty.

Prevalence of Themes

The most frequent topic was found to be mentor qualities and was emphasized by 31 (82%) of the articles reviewed. The most commonly discussed mentor qualities deemed to be essential for an effective mentor were acting as a professional role model (18 [58%]), staying involved, specifically in terms of time and effort (14 [48%]), being compassionate/kind/supportive (12 [39%]), acting as a critic/evaluator/assessor (10 [32%]), being a leader in the field (9 [29%]), and challenging the surgical student (9 [29%]).

The setup of mentorship relationships was often discussed in the literature. Twenty of the reviewed articles (53%) outlined formal mentoring programs, which assigned mentors to mentees, and had structured meeting times set aside to ensure adequate communication. The rest either

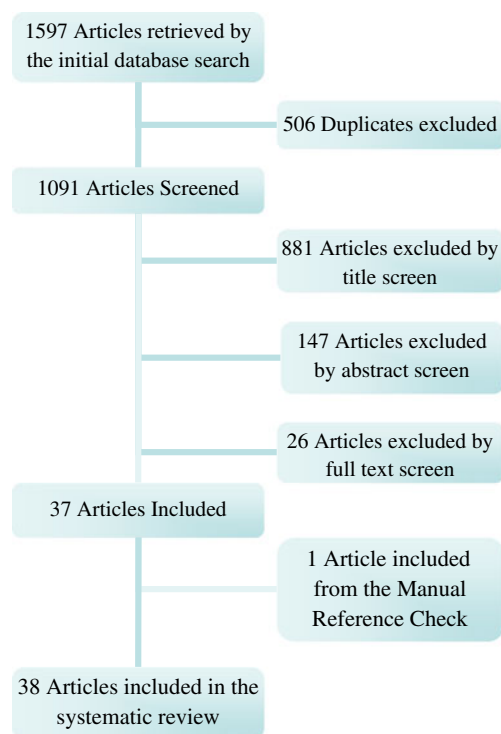


Fig. 1 Exclusion process

Table 3 Articles reviewed

Author	Year	Article type
Assael [1]	2010	Commentary/editorial
Cloyd et al. [3]	2008	Observational study/survey
Cochran et al. [4]	2004	Survey
Cohen et al. [5]	2007	Commentary/editorial
Cox [6]	1989	Commentary/editorial
Cutter [7]	2006	Commentary/editorial
Dunnington [8]	1996	Commentary/editorial
Dunnington and DaRosa [9]	1994	Commentary/editorial
Fenner [12]	2006	Commentary/editorial
Flint et al. [13]	2009	Survey
Franzese and Stringer [14]	2007	Review
Goldwyn [15]	2009	Commentary/editorial
Gough [16]	2008	Commentary/editorial
Gurgel et al. [17]	2010	Survey
Hernandez [18]	2009	Commentary/editorial
Holt [19]	2008	Commentary/editorial
Hoover [20]	2005	Commentary/editorial
Hoover [21]	2006	Commentary/editorial
Jaffer et al. [22]	2009	Survey
Ko et al. [23]	1998	Survey
Konstantakos [24]	2003	Commentary/editorial
Loop [25]	2000	Commentary/editorial
Macafee [26]	2008	Review
Memon and Memon [28]	2009	Commentary/editorial
Moller et al. [29]	2008	Commentary/editorial
Neumayer et al. [30]	1993	Survey
Nguyen and Divino [31]	2007	Survey
Pellegrini [32]	2006	Commentary/editorial
Shiwani [37]	2007	Commentary/editorial
Shortell and Cook [38]	2008	Survey
Souba [40]	1999	Commentary/editorial
Souba [41]	2000	Commentary/editorial
Thakur et al. [42]	2001	Survey
Toledo-Pereyra [43]	2009	Commentary/editorial
Warnock [44]	2006	Commentary/editorial
Weilepp [46]	1992	Commentary/editorial
Wilson [47]	2004	Commentary/editorial
Zusan et al. [48]	2006	Commentary/editorial

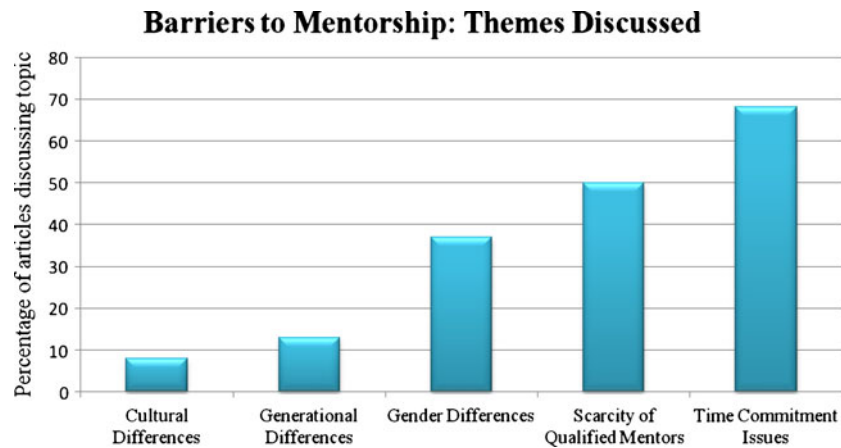
made no mention of such programs or addressed informal relationships in which mentees are largely left to form their own relationships with chosen mentors. Neither approach was implicated as being more effective; however, formal programs did ensure that all of those who required or desired a mentor were paired with one. Of the 38 papers reviewed, 30 (79%) included one-on-one mentoring relationships, 4 (10.5%) discussed the possibility of having more than one mentor, and 4 (10.5%) did not specify. Eight

of the articles (21%) described the stages of development for mentor–mentee relationships in-depth. This progression generally starts with the initiation of the relationship, followed by the growth of the mentee under the guidance of the mentor, and finally the culmination of the relationship once the mentor has imparted a sufficient amount of knowledge and the mentee can be independent (although the relationship will most likely continue in another form).

Regarding difficulties in mentorship, many explained and some even advised on how to overcome barriers to effective surgical mentorships (Fig. 2). Twenty-six of 38 (68%) mentioned the temporal difficulties inherent in mentoring surgical students due to already busy schedules. To overcome these difficulties, some authors suggested formally adding time to meet with mentees to the mentor's schedule (and reducing obligations elsewhere). Others encouraged mentors to meet with mentees in a nonmedical setting, which would also allow for discussions regarding personal aspects of life. Furthermore, 19 articles reviewed (50%) discussed the scarcity of qualified mentors, as a result of lack of mentorship training, resulting in a rising number of trainees searching for mentors. Fourteen (37%) of the articles reviewed addressed the subject of gender differences in these relationships, mainly the shortage of female mentors [29, 30, 38, 42]. Due to this shortage, the vast majority of female mentees are paired with male mentors. Although gender may not directly affect mentorships in the professional setting, men and women may encounter different decisions and barriers throughout their careers and personal lives. Nevertheless, Gurgel et al. found that only about 8% of residents (both male and female) have a preference for a mentor of the same sex [17]. Other barriers were considered less frequently: five (13%) discussed generational differences and only three (8%) discussed cultural differences. The former is experienced when there is a large age difference between the mentor and mentee. These differences are important to consider, as expectations change from generation to generation. For example, the current generation of surgical trainees places a much stronger emphasis on personal life than their mentors. These differences must be considered to ascertain the mentee's goals. Likewise, it is important that the mentee put the mentor's expectations in context and perform at the desired level. Similarly, cultural differences are becoming more important to consider as the medical environment continues to become more connected internationally. It is especially important to be culturally conscious when mentoring international students or fellows.

To justify adding yet another time commitment to a surgeon's busy schedule, such as a long-term mentor–mentee bond, tangible outcomes and benefits are necessary to ensure that time is not being wasted. Nine (24%) articles defined the need to evaluate relationships based on how

Fig. 2 Themes discussed regarding barriers to mentorship



they affect the preparedness and future success of mentees (for example, using Likert scale surveys). However, no article presented a standardized survey to assess successful mentorships, which would be a useful tool for mentors and mentees in order to assess their progress. Another benefit (mentioned by 15 of the 38 included articles (39%)) highlighted the role mentors can have in their students entering surgical fields and/or selecting a career or specialty. Most importantly, 27 articles (71%) specifically discussed the benefits of mentoring relationships, and no papers purported that mentoring relationships were unnecessary or negatively impacted surgical students.

Discussion

All of the articles we reviewed discussed several aspects of surgical mentoring relationships. As a result, most of the themes and categories we examined (Table 2) were presented multiple times. The literature provides plenty of information that a developing—or even well-established—surgical mentor will find useful in creating and/or improving a mentoring program or relationship. Characteristics that are most desirable for a mentor to possess were discussed by a majority of the papers we reviewed, namely, acting as a professional role model, being supportive of and involved in the trainee's progress, serving as a trusted evaluator of the mentee, and being a leader in their field [1, 4–9, 12–20, 23–26, 28, 29, 32, 37, 41–44, 48]. Mentors should strive to embody these traits. Those who do may have greater success in attracting and training mentees.

Unfortunately, this systematic review also found many themes and aspects of surgical mentorship that are under-examined in the literature. The qualities and involvement of a mentee were defined briefly by several articles [5, 6, 8, 9, 14, 15, 20, 29, 40, 41, 43, 46, 48]. However, these discussions were very limited and provided no consensus as to what role the mentee must play or what actions they

must take to ensure a successful relationship. It should be emphasized that a mentor–mentee relationship requires a commitment from the mentee as well as the mentor—both parties are needed to make the relationship successful. Thus, a stronger exploration of mentee qualities and goals will give useful insight into creating even more successful relationships. Furthermore, though the lack of female mentors (which is a problem in other fields of medicine as well [35]) was approached by several articles [7, 21, 29, 30, 38, 42, 46], similar issues with generational [7, 21, 29, 32, 47] and cultural differences [7, 21, 29] were scarcely explored. Though Gurgel et al. found that only roughly 8% of mentees prefer a mentor of the same sex [17], several papers discussed how female trainees may benefit from having a female mentor who can help them overcome barriers that their male counterparts may not fully understand [21, 44, 46]. Similarly, the generational gap between mentees and mentors can strain the relationship if the individuals have different goals and expectations. As previously mentioned, there is some variation in work ethic between generations, especially with the current generation of surgical residents who more strongly emphasize their family and personal lives. It is necessary to reconcile these differences to avoid problems between the two parties. Culture is also a major concern due to the increase in international students and fellows in which intercultural communication is mandatory [29]. Each cultural group has unique guidelines for how an individual must approach those “higher-up.” If not understood, miscommunications may occur when in reality both parties are doing what comes natural to them. Understanding all of these differences will allow a surgeon to mentor any surgical trainee that they are approached by, independent of gender, age, or race.

As the surgical environment changes, all of the themes discussed will be crucial for mentors to consider. With the current ACGME regulations restricting residents to an 80-h work week [27, 33, 39, 45], strong mentor–mentee

relationships could play a crucial role in alleviating rising concerns regarding the decrease in “on-the-job” training time. Some studies have reported a change in the volume of surgical procedures residents are exposed to due to these regulations [2, 45]. Advances in nonoperative treatments and increasing use of minimally invasive surgeries have changed the mix of cases that trainees are exposed to. Eckert et al. found that, although the operative volume seen by general surgery residents remained unchanged from 1999 to 2008, residents were exposed to more minimally invasive techniques at the cost of decreased exposure to more complex open cases [10]. Because mentors work so closely with their mentees, they have the opportunity to highlight aspects of the mentee’s training or specific techniques that may need more attention. Mentorship will play a crucial role in surgical training models, as the expectations placed on surgical trainees continue to increase despite the ACGME time regulations.

Another issue that mentorship will be vital for overcoming is the reduction in medical students interested in surgery [18]. When considering the persistent concerns with work–life balance and burnout among surgeons, these fears are understandable. Fifteen of the articles we reviewed described the influential role mentors have in the careers their mentees pick [3, 4, 13, 17, 20–23, 25, 26, 28, 29, 38, 42, 43]. Although mentors should never push their mentees to pursue a specialty for the mentors’ satisfaction or benefit, by being an effective mentor and highlighting the aspects of the surgical careers that they enjoy, surgery mentors may alleviate many of the fears students have when considering surgery as their future career [36]. Ultimately, mentors represent their specialty when interacting with their mentees and as such influence the future generation’s perception of surgery. They have the power to ensure the future and survival of the surgical profession.

Fortunately, not all changes to the surgical field are problematic. Technological advances such as web education and simulations have vastly altered how surgical trainees receive their training [33]. These tools are being harnessed during this current evolution of surgical training to streamline and improve resident education. It is only natural that mentors and mentees alike take advantage of these opportunities. For example, though telementoring is often used transiently to teach trainees certain procedures or skills, this technology could be used as a more long-term solution for bringing mentors and mentees together. Our review found that time constraints were one of the biggest obstacles to mentorship. Technology could allow mentors and mentees to meet from wherever they are when it is most convenient for both parties. By eliminating the need for extensive planning and time management, productive meetings can occur more frequently.

Biases and Limitations

The articles reviewed had several biases and limitations. The most striking problem is the scarcity of in-depth, scientifically sound studies that can perceptibly define the benefits or ideal structure of surgical mentorships. Of our 38 articles, only 9 fell into that category. Though the rest provided useful guidelines and pieces of advice, editorials and commentaries can only give personal views that are not supported by data. A related problem is the inherent bias in the literature. Most authors write about mentoring relationships based on their personal experiences. Therefore, some readers may find the literature limited in scope. For those who wish to use the literature to help them progress in their own mentor–mentee connections or even develop formal mentoring programs within their department, this handful of articles may be insufficient, and clearly, more research is needed.

Future Research

In performing this systematic review, we identified several necessary steps for future research. We believe that more attention needs to be paid to themes insufficiently approached in the literature so far. Potential themes for future research include defining desirable mentee traits and expectations, overcoming generational and cultural differences, and methods to overcome current barriers to effective mentorship (such as time constraints and lack of qualified mentors). Another important issue is the lack of an assessment tool to evaluate mentorships in the surgical environment. The creation of such a survey will allow mentors and mentees to not only judge their progress, but also to highlight areas where the relationship would benefit from additional attention.

The mentoring of surgical students is an art that has evolved considerably since Halsted’s apprenticeship model and have helped the field expand into new disciplines. However, there is little doubt that surgeons require strong mentorship as part of their training. After all, the life of a surgeon is unique and often challenging, and an effective mentor can be the difference between a surgeon who is skilled and fulfilled as opposed to simply competent. The changing surgical environment requires a style of mentorship distinct from that in other forms of medicine. The themes covered in this review should be continually updated to stay current with the evolving needs of training programs, as mentors will continue to be a necessary component of surgical education in the future. Mentorship is a valuable art, and as Rohrich stated, “we need to make every effort to revive it” [34]. In the end, producing high-quality surgeons requires more than instruction, “it requires strong mentorship” [29].

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