



Improving communication between medical and surgical specialists using interspecialty education strategies: A mixed-methods study

Douglas S. Krakower^{1,2,3}, Darshan Kothari^{2,3}, Amy M. Sullivan^{3,4},
Ayesha Abdeen^{3,5}, Wendy Stead^{1,2,3}

¹Division of Infectious Diseases, Beth Israel Deaconess Medical Center, Boston, MA, USA.

²Department of Internal Medicine, Beth Israel Deaconess Medical Center, Boston, MA, USA.

³Harvard Medical School, Boston, MA, USA.

⁴Shapiro Institute for Education and Research, Beth Israel Deaconess Medical Center, Boston, MA, USA.

⁵Department of Orthopaedic Surgery, Beth Israel Deaconess Medical Center, Boston, MA, USA.

Address for correspondence:

Douglas S Krakower, Division of Infectious Diseases, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA.
dkrakowe@bidmc.harvard.edu

Received: October 20, 2015

Accepted: November 05, 2015

Published: November 26, 2015

ABSTRACT

Objective: Poor communication between medical and surgical specialists negatively impacts patient care and represents a serious challenge for medical educators. The objective of this study was to measure the effect of a brief interspecialty education program on perceived communication between medical and surgical specialists at a US medical center. **Methods:** In 2011, an interspecialty education program ("Diagnosing Prosthetic Joint Infections") was developed and administered by orthopaedic surgery (OS) and infectious diseases (ID) faculty to members of both divisions. The 60-minute program included a review of diagnostics followed by small mixed-group discussions about optimal diagnostic approaches. Surveys (immediately pre- and post-intervention) and a focus group (3 months post-intervention) assessed the impact of the program on interspecialty communication and collaboration. **Results:** Seventeen OS (41% of whom were trainees) and 13 ID (46% trainee) providers participated. Twenty-nine percent of OS and 62% of ID providers were female. Post-intervention, the proportion of participants perceiving that "other" specialty providers were often "effective communicators" ($p=0.014$) and "effective collaborators" ($p=0.025$) increased. All participants believed interspecialty education would improve communication. Focus group participants perceived that the program improved interspecialty communication, organizational practice, and patient care. **Conclusions:** These findings demonstrate that brief interspecialty education programs can improve communication between medical and surgical specialists and could enhance patient care.

KEY WORDS: Communication; Collaboration; Healthcare practitioner; Interspecialty; Education; Mixed-methods

INTRODUCTION

Poor communication among physicians from different specialties represents a serious challenge to the academic medical community. Suboptimal communication practices are common and can lead to erosion of interspecialty relationships and negative patient outcomes [1-4]. Modeling of poor communication and teamwork by academic faculty can encourage similar behavior among trainees [5-8]. At academic medical centers, where complex patients routinely require co-management by medical and surgical specialists with intensive time constraints, brief educational interventions to improve communication between medical and surgical specialists are needed.

Interprofessional education programs, in which providers from different training backgrounds or specialties assemble to engage in interactive, collective educational experiences relevant to their shared clinical practice, represent promising interventions to improve communication and collaboration across healthcare professions. Over the last two decades, there has been a growing body of literature assessing the effects of interprofessional education upon collaboration and quality of care [9-14]. When focused on carefully chosen complex healthcare topics best

managed by intensive collaboration between multiple disciplines, interprofessional education programs have been shown to lead to improvements in provider attitudes, knowledge, behavior and patient care [10, 15-17]. These programs typically bring together providers from different professions, such as nurses and physicians. Less often do they focus on the educational needs of different specialties within the same profession, yet the divide in skills and attitudes about care between these providers can be just as wide [18-22]. Though technically members of the same "profession," medical and surgical specialists can approach co-managed healthcare topics from widely varying vantage points. Several years of additional training in a specialty field creates gaps in shared experience among physicians that may be as difficult to bridge as interprofessional gaps. Different specialists read different journals, attend different conferences, speak different technical languages and practice within different systems of service delivery [23]. Some evidence suggests physicians may be less inclined toward medical interspecialty teamwork than other health professionals [24, 25]. Programs that are designed to bring together members of different specialties *within* a healthcare profession can be defined as *interspecialty* education programs. Interspecialty educational programs

designed using theoretical frameworks and strategies utilized effectively in interprofessional education could have great potential to bridge the detrimental cultural gap between medical and surgical specialists by meeting the need for a shared experience that draws upon the literature and experience of both specialties.

Few studies have tested whether interspecialty education programs can improve communication between medical and surgical specialists. Moreover, interspecialty education programs often involve multiple educational sessions [17, 26, 27] that could be perceived as overly time consuming by medical and surgical specialists who practice at academic medical centers and face intensive time constraints. Therefore, it is desirable to develop and test interspecialty education programs that are brief, feasible, and easily reproduced by clinicians at academic medical centers. This study examined the impact of a 60-minute, pilot interspecialty education program on perceived communication and collaboration between infectious diseases (ID) and orthopaedic surgery (OS) providers at an academic medical center.

METHODS

Study Design

A two-part research survey was administered to ID and OS providers in a pre-intervention/post-intervention design in order to measure the effect of the educational intervention on provider perceptions of interspecialty communication and collaboration. A focus group was conducted 3 months following the intervention to further explore the perceived impact of the interspecialty education program on interspecialty communication and collaboration as well as provider practices surrounding diagnosis of prosthetic joint infection. The Institutional Review Board at Beth Israel Deaconess Medical Center (BIDMC) approved all study procedures. Verbal consent was obtained from all providers who participated in the study.

Intervention

All providers from the OS and ID departments at BIDMC, an academic medical center in Boston, MA, were invited by email or in-person to participate in a 60-minute interspecialty education program focused on optimal diagnostic approaches to prosthetic joint infection. The session was developed and administered by faculty from the OS and ID departments at BIDMC. The format of the session was based upon interprofessional education principles [9, 28] and included 3 phases: (1) a didactic, evidence-based review of prosthetic joint infection diagnosis techniques presented by faculty members from the OS and ID divisions; (2) in-depth, interactive, case-based discussions among small mixed groups of OS and ID providers regarding the complexities of implementing prosthetic joint infection diagnostics at our institution; and (3) a larger wrap-up review in which each small group shared ideas generated during their discussions with all session attendees.

Measures

Quantitative Surveys: Program attendees who consented to participate in the study completed self-administered, anonymous, paper-based, <5-minute (13-item pre-program and 10-item post-program) quantitative surveys immediately before and after the interspecialty education program. Surveys assessed participant demographics, provider experience managing prosthetic joint infection, perceptions of communication and collaboration among OS and ID providers, and beliefs regarding the impact of interspecialty education programs on future interspecialty communication. Provider experience was measured by the number of cases of prosthetic joint infection managed in the prior year. A five-item Likert scale (never, seldom, sometimes, often, always) assessed providers' perceptions of how frequently members of "my specialty" and the "other specialty" were effective communicators and collaborators, and providers' beliefs regarding the impact of the interspecialty education program on future interspecialty communication. The survey questionnaire was initially drafted by a member of the research team. To enhance validity, the questionnaire was reviewed in detail for content, comprehension and clarity by members of the research team who specialize in ID, OS, and medical education research and by a group of experts in medical education at BIDMC who were not members of the research team. The survey was then revised in an iterative manner based on feedback from these diverse reviewers.

Qualitative Focus Group: All participants were invited to a focus group three months after the interspecialty education program to discuss whether the program impacted interspecialty communication and collaboration and/or their approach to diagnosing prosthetic joint infection. A member of the study staff facilitated the group discussion using a topic guide consisting of open-ended questions and probes designed to generate discussion about the perceived impact of the interspecialty education program on personal and organizational communication practices. This guide was designed based on a modified version of Kirkpatrick's Levels of Evaluation suggested by Barr and colleagues, in which outcomes of interprofessional education programs are classified into six categories: (1) learners' reactions; (2) modification of attitudes and perceptions; (3) acquisition of knowledge and skills; (4) change of behavior; (5) change in organizational practice; and (6) benefits to patients [29, 30]. The discussion was audio-recorded and transcribed verbatim. Transcripts were de-identified to maintain confidentiality.

Analysis

Quantitative surveys: All survey questions were analyzed with descriptive statistics. Fisher's exact test was used to compare perceptions of communication and collaboration between OS and ID providers. McNemar's test was used to assess for changes in provider perceptions of communication and collaboration after the study session. *P*-values < 0.05 were considered significant. Statistical analyses were performed with SAS v.9.3 (Cary, NC).

Qualitative Focus Groups: An analytic inductive approach [31] was used to analyze the focus group discussion transcript, whereby Kirkpatrick’s Levels of Evaluation provided a framework for analyses. Members of the study team reviewed the transcript for sections of text that were relevant to the main study questions. These sections were labeled with a series of preliminary descriptive codes. The codes were then applied to the transcript, and coding discrepancies were resolved through group discussion to create a preliminary coding scheme. The coded transcript was analyzed for themes relating to Kirkpatrick’s Levels of Evaluation, and the coding scheme was refined in an iterative manner until no new themes emerged and the coding scheme was considered to be stable. Interpretations of study data are based on this final coding scheme.

RESULTS

Quantitative Survey Results

Demographics: Forty-seven clinical providers were invited to participate in the study, 31 providers attended the interspecialty education program, and 30 providers (17 OS and 13 ID) completed pre-session surveys, for an overall response rate of 64%. Of these 30 providers, 77% (13 OS and 10 ID providers) completed post-session surveys. A majority of OS providers were men, whereas a majority of ID providers were women (Table 1). OS providers were attending physicians, trainees (OS residents), or associate clinicians (nurse practitioners, physician assistants), while ID providers were either attending physicians or trainees (ID fellows).

Experience Managing Prosthetic Joint Infections: Most providers from both specialties reported that they had managed a high volume of prosthetic joint infection cases in the prior year (Table 1). Nearly all providers co-managed at least 75% of their prosthetic joint infection cases with members of the other specialty.

Table 1. Demographics and experience managing prosthetic joint infections among orthopaedic and infectious diseases providers (n=30) at an academic medical center.

		Orthopaedics (n=17)	Infectious Diseases (n=13)
		% of Providers (n)	
Gender	Women	29 (5)	62 (8)
	Men	71 (12)	38 (5)
Training level	Physician, Attending	35 (6)	46 (6)
	Physician, Trainee	41 (7)	54 (7)
	PA or NP	24 (4)	0 (0)
Number of prosthetic joint infections managed in prior year	0 to 5	18 (3)	15 (2)
	6 to 10	18 (3)	23 (3)
	11 to 20	53 (9)	38 (5)
	> 20	12 (2)	23 (3)
Percent of prosthetic joint infections co-managed with other specialty	< 75	12 (2)	0 (0)
	>75	88 (15)	100 (11)

PA = Physician Assistant; NP = Nurse Practitioner.

Perceptions of Communication and Collaboration: Given small sample sizes and few responses at the extremes of the Likert scales, the scales were dichotomized for analyses, such that “often” and “always” were analyzed as “often,” whereas “never,” “seldom,” and “sometimes” were analyzed as “not often.” Prior to the interspecialty education program, 82% (14/17) of OS providers indicated that ID providers were often “effective communicators,” whereas only 31% (4/13) of ID providers indicated that OS providers were often “effective communicators” ($p=0.008$; Table 2). Otherwise, there were no significant differences in perceptions of communication and collaboration between the 2 specialties before the session (Table 2).

After the intervention, there was an increase in the proportion of participants who perceived that members of the “other” specialty were often “effective communicators” ($p=0.014$) and “effective collaborators” ($p=0.025$) (Table 3). In terms of providers’ perceptions about the members of their own specialty, there was no change after the intervention in the proportion of participants who perceived that members of their own specialty were often “effective communicators” or “effective collaborators,” although there was an increase in the proportion of providers who perceived that members of their own specialty were often “open to the viewpoints of others.”

Beliefs regarding the Impact of Interprofessional Education Programs on Interspecialty Communication: After the interspecialty education program, 100% (23/23) of respondents from both specialties believed that interspecialty education programs would improve communication between the 2 specialties. All participants also indicated interest in improving communication with members of the other specialty. One-hundred percent (13/13) of OS providers believed that ID providers were interested in improving communication, while 80% (8/10) of the ID providers believed that OS providers were interested in improving communication.

Table 2. Perceptions of communication skills among orthopaedic and infectious diseases providers before (n=30) and after (n=23) an interprofessional education program at an academic medical center.

Perceived Characteristic	Pre-intervention			Post-intervention			
	Orthopaedics (n=17)	Infectious Diseases (n=13)	P*	Orthopaedics (n=13)	Infectious Diseases (n=10)	P*	
	% of Providers (n)			% of Providers (n)			
Members of the other specialty are often...	Effective communicators	82 (14)	31 (4)	0.008	92 (12)	70 (7)	0.28
	Effective collaborators	76 (13)	77 (10)	1.0	92 (12)	90 (9)	1.0
	Open to the viewpoints of others	76 (13)	77 (10)	1.0	85 (11)	70 (7)	0.62
Members of my own specialty are often...	Effective communicators	35 (6)	62 (8)	0.14	62 (8)	90 (9)	0.18
	Effective collaborators	59 (10)	92 (12)	0.09	62 (8)	90 (9)	0.18
	Open to the viewpoints of others	59 (10)	77 (10)	0.44	85 (11)	80 (8)	1.0

*Fisher's exact test.

Table 3. Changes in perceptions of communication skills among orthopaedic and infectious diseases providers before (n=30) and after (n=23) an interprofessional education program at an academic medical center.

Perceived Characteristic	Pre-Intervention (n=30)	Post-Intervention (n=23)	Test for Change*	
	% of Providers (n)		P	
Members of the other specialty are often...	Effective communicators	60 (18)	83 (19)	0.014
	Effective collaborators	77 (23)	91 (21)	0.025
	Open to the viewpoints of others	77 (23)	78 (18)	0.16
Members of my own specialty are often...	Effective communicators	47 (14)	77 (17)†	0.059
	Effective collaborators	73 (22)	74 (17)	0.56
	Open to the viewpoints of others	67 (20)	82 (19)	0.046

*McNemar's test; participants who did not submit pre- and post-intervention surveys were excluded from testing. †Total n=22 for this survey item, as 1 participant did not respond to this item post-intervention.

Qualitative Focus Group Results

Eight OS providers (5 attending physicians, 1 trainee, 1 physician assistant, and 1 nurse practitioner) and 4 ID providers (2 attending physicians and 2 trainees) participated in the focus group. The discussion generated numerous themes regarding the impact of the interspecialty education program on interspecialty communication and collaboration in clinical practice. Themes were grouped according to modified Kirkpatrick's Levels of Evaluation.

Theme 1: Learners' reactions

Focus group participants shared positive reflections about the interspecialty education program including:

"It was the best session in terms of bringing people together that I have experienced in quite some time...we heard quite a bit of talk afterwards among the Orthopaedic people; attendings, residents, [nurse practitioners]...there was consensus that it was well put together...I think we learned a lot...there was good interaction" (OS Attending)

"...one of the big things I took away was putting faces with names...I talk to people all the time on the phone...I e-mail people...I don't know what they look like so that was kind of nice too." (OS Physician Assistant)

Theme 2: Modification of attitudes and perceptions

Participants described a perceived increase in ease of communication between OS and

ID providers after the interspecialty education program:

"Certainly the level of communication and seeing the receptivity of people to respond to emails, to get this or get that when you see the patient next... I have a sense that got better after that session." (ID Attending)

A change in perception of the care team from a set of distinct specialist providers with

different skill sets and approaches to care to a more cohesive interspecialty group functioning as a collaborative team was also repeatedly expressed:

“For me in particular the combativeness that I’ve often experienced... is over. You’re in it for the long run. These are your patients and we’re taking care of them together. That changes everything.” (OS Attending)

“It totally feels like a team. It does. It doesn’t feel like our patients or your patients.” (OS Attending)

Theme 3: Acquisition of knowledge and skills

Focus group participants reported acquiring new understanding of interspecialty roles during the study:

“We [ID] consider ourselves as a full service. We take them from the inpatient...reviewing the micro, deciding on the antibiotics and we follow them until they are off everything... we monitor their labs...we are the ones that make the decision about...switching antibiotics due to complications or toxicities.” (ID Attending)

Response: *“That’s what I have felt in the last three months. I did not actually understand [your role].”* (OS Attending)

New knowledge of interprofessional roles, particularly the role of the OS physician assistants, nurse practitioners, and resident trainees, was also identified:

“It occurs to me...when I try to contact an Ortho attending directly, I rarely copy a trainee or [a nurse practitioner/physician assistant]...and that’s a mistake because they talk to you about 1000 times more a day than I do.” (ID Fellow)

“My chief resident or my floor resident...they are like my right hand. We all got to know.” (OS Attending)

“On any outpatient, (my [nurse practitioner]) should be at the header of the note...because she is the one who deals with a lot of the outpatients now.” (OS Attending)

Theme 4: Change of behavior

Participants reported several changes in provider behavior as a result of the interspecialty education program, most notably in areas of interspecialty communication and in the clinical practice of diagnosing prosthetic joint infections:

“You felt because you had sat next to them or had spoken to them, you now had a name with a face. It facilitated you feeling like you could reach out to them more readily so that...did actually change the amount of communication that I personally did because I was like, well they’re not so... scary.” (ID Fellow)

“I can definitely say that I’ve changed some things that I’ve done since this meeting which I think is important...by telling us we need six [tissue culture] samples...that changes how we do things and that’s really important and...it’s best for the patient which is the bottom line...We’ve definitely gotten away from swabbing and more to fluid and tissue [cultures].” (OS Physician Assistant)

However, at least one provider reported no improvement in communication after the program with “other” specialty colleagues with whom communication had previously been suboptimal:

“Providers I had good communication with before, I have good communication with after. The ones I had more challenge reaching before [were] about the same.” (ID Fellow)

Theme 5: Changes in organizational practice/Benefits to patients

In addition to the reported improvement in patient care that focus group participants felt would

result from a more uniform and evidence-based approach to clinical practice, one OS Attending shared a story about a specific patient care situation that had benefited from improved communication between ID and OS providers.

“[ID Fellow] and I just had a...mutual patient who has had a complex history of infected joints...and very much at a point in the road where the decision making was combined between surgeons and ID and the patient and the patient’s family...and it was clear that we needed to get all the players together, which is not something that we do that much from our perspective. [ID Fellow] was very persistent about moving it forward and it happened—actually this was just last week—and it worked out very well...It was great for the patient. He really felt that things were fully addressed.” (OS Attending)

Though not a reported result of the interspecialty education program per se, several future organizational practice changes were suggested during the focus group discussion:

“...most of the [OS] attendings have mid-level [nurse practitioner, physician assistant] coverage and I can get you guys the list of that because we are definitely able to check our e-mail more frequently.” (OS Physician Assistant)

“...we are trying to organize a multidisciplinary trauma clinic where you—I’m certain you [ID] will be invited—to come...to see patients with us...” (OS Attending)

“I would have a...joint infection list for all the people who have...joint infections in house. And if any one of us gets consulted from the emergency room, that patient should go on the list.” (OS Attending)

“Is there an opportunity to...have a...monthly...get-together and talk about [prosthetic joint infection] patients...to bring us together?” (OS Attending)

“I’ve been...familiar with...a couple of places where there are now Orthopaedic-ID teams...a group of ID staff who do all the Orthopaedic consultations...I think there are some real benefits to doing that in terms of communication, continuity of care, getting it right the first time without misunderstandings...” (ID Attending)

DISCUSSION

This mixed-methods study demonstrated that a brief, feasible interspecialty education program can improve perception of communication and collaboration between medical and surgical specialists at an academic medical center. The interspecialty education program also resulted in reports of more uniform clinical practices regarding a complex medical topic and improvements in so called

“collaborative competency,” considered by many to be the primary goal of interprofessional education programs, by enhancing understanding of interdisciplinary roles of different team members [28].

This study also demonstrated that qualitative evaluation of an interspecialty education program by means of an interspecialty focus group is helpful for measuring the impact of the program. Moreover, as focus group participants in this study introduced several novel organizational practice changes, this study suggests that focus groups after interspecialty education programs can further enrich educational outcomes by providing a forum for continued interspecialty interaction among providers who are primed to discuss issues of collaborative competency. This finding is not surprising given the prominent role of small group interactive learning that is central to interprofessional education curricula in general, and it suggests that combining interspecialty education programs with brief interspecialty focus group sessions could augment the positive effects of the education programs [9, 28]. Notably, two of the organizational changes that were suggested by focus group participants, the creation of a regular combined OS-ID case-based conference and exchange of information about which physicians prefer communication through an associate clinician (i.e., physician assistant or nurse practitioner), were implemented shortly after the focus group occurred, which provides independent confirmation that participants’ expressed intentions to improve communication were followed up with at least some congruent actions.

The study results confirm those of prior studies demonstrating that interdisciplinary programs can enhance positive perceptions between medical providers with different specialty training backgrounds [32, 33]. Yet this study advances the field further by illustrating that interspecialty education programs can also improve perceptions about communication and collaboration between medical and surgical providers, which bridges a communication divide that might be expected to be substantially wider given the markedly different training and practice cultures of medical and surgical specialists [34, 35]. Furthermore, the results of the focus group discussion suggest that providers value face-to-face contact with interspecialty colleagues to balance remote methods of communication (e.g. email and telephone discussions). This finding is particularly noteworthy given the current emphasis on technology-mediated and online learning in medical education [36, 37], as educational programs that do not involve personal contact may not result in the same degree, or any, cross-specialty bonding.

The study findings should be interpreted in the context of the study design. Non-response bias may have influenced the quantitative study results given the response rate of 64%. Qualitative data were collected during a single focus group discussion, so it is not known if saturation in the emergent themes was achieved. As this study involved a small number of participants from a single, quaternary-care academic center, the results may not be generalizable

to all medical centers. However, it would be reasonable to anticipate that similar educational programs would achieve comparable outcomes at other academic centers of similar size and scope and may serve a valuable role in answering the Institute of Medicine’s call for more formal curricula in interspecialty communication and collaboration for physician trainees at all levels [38, 39]. This study focused on interspecialty communication between OS and ID providers, so the study findings may not be applicable to healthcare practitioners from other specialties. Further studies of interspecialty education programs focused on complex medical topics managed by other combinations of specialists would shed light on whether these programs are likely to be efficacious among a broader range of specialties. Finally, the quantitative portion of this study was only designed to capture immediate changes in perceptions after the interspecialty education program, and the improvements that were measured may not have persisted over time. Yet the qualitative study, conducted 3 months after the quantitative survey, offered some evidence that positive outcomes did persist until at least that time point. Given that providers who participated in the focus group tended to endorse intentions to continue with improved interspecialty collaboration, it seems likely that at least some of the positive outcomes associated with our program may be durable.

In conclusion, suboptimal communication between medical and surgical specialists can be a barrier to optimal patient care, and there is an unmet need to develop educational interventions that can enhance interspecialty communication and collaboration between these 2 groups of providers. The positive impact of a brief, scalable pilot interspecialty education program on provider perceptions of interspecialty communication and collaboration suggests that further development and testing of similar interspecialty programs is warranted. If the efficacy of brief interspecialty education programs is confirmed in larger studies, this type of intervention may serve as a useful component of educational curricula designed to improve communication between medical and surgical providers and could potentially improve the care of patients who receive medical and surgical interdisciplinary care.

ACKNOWLEDGEMENTS

The authors collected and managed study data using REDCap electronic data capture tools hosted at Beth Israel Deaconess Medical Center [40]. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources. The authors presented an earlier version of the manuscript as a poster at the Northeastern Group on Education Affairs (of the American Association of Medical Colleges) Annual Meeting in Boston, MA on March 23-25, 2012.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

1. Dunn AS, Markoff B: Physician-physician communication: what's the hang-up? *J Gen Intern Med* 2009, 24(3):437-439.
2. Etesse B, Jaber S, Mura T, Leone M, Constantin JM, Michelet P, Zoric L, Capdevila X, Malavielle F, Allaouchiche B et al: How the relationships between general practitioners and intensivists can be improved: the general practitioners' point of view. *Crit Care* 2010, 14(3):R112.
3. O'Malley AS, Reschovsky JD: Referral and consultation communication between primary care and specialist physicians: finding common ground. *Arch Intern Med* 2011, 171(1):56-65.
4. Ruth JL, Geskey JM, Shaffer ML, Bramley HP, Paul IM: Evaluating communication between pediatric primary care physicians and hospitalists. *Clin Pediatr (Phila)* 2011, 50(10):923-928.
5. Santen SA, Hemphill RR: A window on professionalism in the emergency department through medical student narratives. *Ann Emerg Med* 2011, 58(3):288-294.
6. Arora VM, Wayne DB, Anderson RA, Didwania A, Farnan JM, Reddy ST, Humphrey HJ: Changes in perception of and participation in unprofessional behaviors during internship. *Acad Med* 2010, 85(10 Suppl):S76-80.
7. Reddy ST, Iwaz JA, Didwania AK, O'Leary KJ, Anderson RA, Humphrey HJ, Farnan JM, Wayne DB, Arora VM: Participation in unprofessional behaviors among hospitalists: a multicenter study. *J Hosp Med* 2012, 7(7):543-550.
8. Ong CC, Tan NC: Unprofessional doctors—are they really born this way? *Ann Acad Med Singapore* 2014, 43(11):521-523.
9. Freeth D: *Effective interprofessional education: development, delivery and evaluation*. Oxford; Malden, MA: Blackwell Pub.; 2005.
10. Hammick M, Freeth D, Koppel I, Reeves S, Barr H: A best evidence systematic review of interprofessional education: BEME Guide no. 9. *Med Teach* 2007, 29(8):735-751.
11. Oandasan I, Reeves S: Key elements of interprofessional education. Part 2: factors, processes and outcomes. *J Interprof Care* 2005, 19 Suppl 1:39-48.
12. Reeves S, Perrier L, Goldman J, Freeth D, Zwarenstein M: Interprofessional education: effects on professional practice and healthcare outcomes (update). *Cochrane Database Syst Rev* 2013, 3:CD002213.
13. Lapkin S, Levett-Jones T, Gilligan C: A systematic review of the effectiveness of interprofessional education in health professional programs. *Nurse Educ Today* 2013, 33(2):90-102.
14. Sockalingam S, Tan A, Hawa R, Pollex H, Abbey S, Hodges BD: Interprofessional education for delirium care: a systematic review. *J Interprof Care* 2014, 28(4):345-351.
15. Kilminster S, Hale C, Lascelles M, Morris P, Roberts T, Stark P, Sowter J, Thistlethwaite J: Learning for real life: patient-focused interprofessional workshops offer added value. *Med Educ* 2004, 38(7):717-726.
16. Shafer MA, Tebb KP, Pantell RH, Wibbelsman CJ, Neuhaus JM, Tipton AC, Kunin SB, Ko TH, Schweppe DM, Bergman DA: Effect of a clinical practice improvement intervention on Chlamydia screening among adolescent girls. *JAMA* 2002, 288(22):2846-2852.
17. Morey JC, Simon R, Jay GD, Wears RL, Salisbury M, Dukes KA, Berns SD: Error reduction and performance improvement in the emergency department through formal teamwork training: evaluation results of the MedTeams project. *Health Serv Res* 2002, 37(6):1553-1581.
18. Kennedy T: Communication in medicine. *Ulster Med J* 1971, 40(1):43-53.
19. Forrest CB: A typology of specialists' clinical roles. *Arch Intern Med* 2009, 169(11):1062-1068.
20. Lingard L, Espin S, Evans C, Hawryluck L: The rules of the game: interprofessional collaboration on the intensive care unit team. *Crit Care* 2004, 8(6):R403-408.
21. Bruce CR, Miller SM, Zimmerman JL: A qualitative study exploring moral distress in the ICU team: the importance of unit functionality and intrateam dynamics. *Crit Care Med* 2015, 43(4):823-831.
22. Madigosky WS, Yamashita TE: Student observations of specialty-associated differences in teamwork behaviour. *Med Educ* 2014, 48(11):1118-1119.
23. Hall P, Weaver L: Interdisciplinary education and teamwork: a long and winding road. *Med Educ* 2001, 35(9):867-875.
24. Leipzig RM, Hyer K, Ek K, Wallenstein S, Vezina ML, Fairchild S, Cassel CK, Howe JL: Attitudes toward working on interdisciplinary healthcare teams: a comparison by discipline. *J Am Geriatr Soc* 2002, 50(6):1141-1148.
25. Reuben DB, Levy-Storms L, Yee MN, Lee M, Cole K, Waite M, Nichols L, Frank JC: Disciplinary split: a threat to geriatrics interdisciplinary team training. *J Am Geriatr Soc* 2004, 52(6):1000-1006.
26. Campbell JC, Coben JH, McLoughlin E, Dearwater S, Nah G, Glass N, Lee D, Durborow N: An evaluation of a system-change training model to improve emergency department response to battered women. *Acad Emerg Med* 2001, 8(2):131-138.
27. Young AS, Chinman M, Forquer SL, Knight EL, Vogel H, Miller A, Rowe M, Mintz J: Use of a consumer-led intervention to improve provider competencies. *Psychiatr Serv* 2005, 56(8):967-975.
28. Oandasan I, Reeves S: Key elements for interprofessional education. Part 1: the learner, the educator and the learning context. *J Interprof Care* 2005, 19 Suppl 1:21-38.
29. Barr H, Freeth D, Hammick M, Koppel I, Reeves S: Evaluations of interprofessional education: A United Kingdom review for health and social care. A review commissioned by the British Educational Research Association. In: London: United Kingdom Centre for the Advancement of Interprofessional Education (CAIPE); 2000.
30. Kirkpatrick DL: *Evaluating training programs: the four levels*, 1st edn. San Francisco Emeryville, CA: Berrett-Koehler; Publishers Group West distributor; 1994.
31. Patton MQ: *Qualitative research and evaluation methods*, 3 edn. Thousand Oaks, Calif.: Sage Publications; 2002.
32. Campion-Smith C, Austin H, Criswick S, Dowling B, Francis G: Can sharing stories change practice? A qualitative study of an interprofessional narrative-based palliative care course. *J Interprof Care* 2011, 25(2):105-111.
33. Stead W, O'Halloran TD, Bernier M, Zimetbaum PJ, Irish J: Using interprofessional education strategies to improve collaborative attitudes among infectious diseases and cardiology physician trainees. *Med Teach* 2012, 34(7):594-595.
34. Hochberg MS, Berman RS, Kalet AL, Zabar SR, Gillespie C, Pachter HL: The professionalism curriculum as a cultural change agent in surgical residency education. *Am J Surg* 2012, 203(1):14-20.
35. Janss R, Rispens S, Segers M, Jehn KA: What is happening under the surface? Power, conflict and the performance of medical teams. *Med Educ* 2012, 46(9):838-849.
36. Robin BR, McNeil SG, Cook DA, Agarwal KL, Singhal GR: Preparing for the changing role of instructional technologies in medical education. *Acad Med* 2011, 86(4):435-439.
37. Han H, Resch DS, Kovach RA: Educational technology in medical education. *Teach Learn Med* 2013, 25 Suppl 1:S39-43.
38. Medicare Payment Advisory Commission (MedPAC) Report to Congress: Improving Incentives in the Medicare Program. Available at: http://www.medpac.gov/documents/reports/Jun09_EntireReport.pdf?sfvrsn=0. (Accessed 21 October 2015).
39. Wynia MK, Von Kohorn I, Mitchell PH: Challenges at the intersection of team-based and patient-centered health care: insights from an IOM working group. *JAMA* 2012, 308(13):1327-1328.
40. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG: Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009, 42(2):377-381.

© SAGEYA. This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted, noncommercial use, distribution and reproduction in any medium, provided the work is properly cited.
Source of Support: Nil, Conflict of Interest: None declared