Development of a Conceptual Framework for Peer Surgical Coaching Programs

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“It always seems impossible until it’s done”

Nelson Mandela

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ABSTRACT

The need for ongoing skills development is well recognized in surgery, but common learning opportunities infrequently translate into real practice changes. The most common continuous professional development modalities used by surgeons in practice are sporadic, remote, provide limited longitudinal learning and little feedback. The need for feedback and deliberate practice for practice improvement is well known. Peer coaching has been associated with higher rates of practice changes, but uptake among surgeons is low. The primary purpose of this study was to develop a conceptual model for peer surgical coaching by determining the perceived need, desired characteristics, attitudes towards, and potential barriers to peer surgical coaching.

To construct this model, multiple steps were taken. The first steps included a mixed studies systematic review, followed by local and international exploration of opinions among surgeons in practice. Finally, we developed and tested the feasibility of a reciprocal peer surgical coaching program.

The results of our research showed that coaching is highly rated by participants and often results in more clinical practice changes than traditional CPD. Our exploration amongst surgeons provided valuable information regarding the structure of coaching programs. We did not detect regional variations amongst participants, and there is openness to participate in surgical coaching programs. Participants agreed that coaching programs should be voluntary, bidirectional, and provide CME credits. Live coaching with a known surgical coach would be the preferred choice. Establishing trust and rapport within the relationship was also an important characteristic. Additionally, autonomy was

highly rated. Motivations to participate included learning new techniques, remaining up to date with surgical practice, and improving patient outcomes. Barriers to participation include surgical culture, logistical issues, perceived lack of need, and issues of coach-coachee dynamics.

The pilot study was done both virtually and in-person and focused on technical and non-technical skills. Participants agreed that autonomy and longitudinality are essential and that bilaterality prevented hierarchical issues between partners. Reciprocity was highly valued only when it was naturally occurring and not forced. Additionally, participants agreed that these programs could improve relationship dynamics and therefore improve patient outcomes.

In conclusion, practicing surgeons rarely receive formal feedback and participation in coaching programs remains low worldwide, but there is high interest and acceptance to participate. Autonomy, development of coaching skills, and trust are essential for increased surgeon participation. This thesis presents a conceptual model and framework that may be used to guide, develop, design, and structure future peer surgical coaching programs.

ABRÉGÉ

Le besoin d'un développement continu des compétences est bien reconnu en chirurgie, mais les opportunités normales d'apprentissage se traduisent rarement par des changements dans la vraie pratique en raison d'un manque de feedback personnalisé. Les modalités plus fréquentes de développement professionnel (DCP) qu'utilisent les chirurgiens dans la pratique sont les présentations d'experts lors d'une conférence, les plateformes digitales de partage vidéo et la lecture de littérature évaluée par les pairs. Mais ce sont des modalités sporadiques, à distance, qui offrent un apprentissage à long terme limité et peu de rétroaction. Le besoin de feedback et d'entrainement pour améliorer la pratique est bien connu. On associe le coaching par des pairs à des taux plus élevés de changements dans la pratique, en comparaison avec les formes traditionnelles d'apprentissage, mais son assimilation parmi les chirurgiens est basse. L'objectif principal de cette thèse était de développer un modèle conceptuel de coaching chirurgical par les pairs en déterminant le besoin perçu de coaching, ainsi que les caractéristiques attendues par les praticiens de cette méthode.

Pour construire ce modèle, plusieurs étapes ont été franchies. Les premières étapes comprenaient une revue systématique, suivie d'une exploration locale et internationale des opinions et des caractéristiques souhaitées pour le coaching parmi les chirurgiens en pratique. Enfin, nous avons développé et testé la faisabilité d'un programme de coaching chirurgical réciproque par les pairs. Les interactions entre les participants ont été menées en personne ou virtuellement, et les sessions comprenaient à la fois des compétences chirurgicales techniques et non techniques.

Les résultats de nos recherches ont montré que le coaching pour les chirurgiens praticiens est très bien noté et que normalement il aboutit à plus de changement dans la pratique clinique que les méthodes traditionnelles de DPC. Notre exploration parmi les chirurgiens a fourni des informations précieuses concernant la structure des programmes de coaching. Nous n'avons pas détecté de variations régionales parmi les participants, nous avons plutôt trouvé que les médecins ont l'esprit ouvert pour participer au coaching, quel que soit leur emplacement. Les participants concordent que le coaching devrait être volontaire, bidirectionnel et fournir des crédits de FME. Le coaching présentiel avec un chirurgien renommé est la formule de choix préféré.

L'établissement de la confiance et des relations au sein de la relation était également une caractéristique importante. De plus, l'autonomie pour choisir le coach et les objectifs de la session ont été très appréciés. Les chirurgiens ont mentionné des raisons de ce choix, telles que : apprendre des nouvelles techniques, rester à jour dans la pratique chirurgicale et améliorer le résultat pour le patient.

Les participants à l'étude pilote ont évalué l'autonomie et la longitudinalité comme des caractéristiques essentielles, et les participants ont convenu que la bilatéralité prévenait les problèmes hiérarchiques entre les partenaires. Cependant, la réciprocité n'était hautement appréciée que lorsqu'elle était naturelle et non forcée. De plus, les participants ont convenu que ces programmes pourraient améliorer la dynamique des relations et donc améliorer les résultats pour les patients.

En conclusion, le retour d'information formalisé et la participation aux programmes de coaching restent faibles dans le monde, mais l'intérêt et l'acceptation de participer sont

élevés. L'autonomie, le développement des compétences de coaching et la confiance sont essentiels pour une participation accrue des chirurgiens. Cette thèse présente un modèle conceptuel et un cadre qui peuvent être utilisés pour guider, développer, concevoir et structurer les futurs programmes de coaching chirurgical par les pairs.

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CONTRIBUTION TO ORIGINAL KNOWLEDGE

The work presented in this thesis constitutes an original contribution to the body of literature in surgical coaching research. Specifically, it provides a conceptual model for the design of peer surgical coaching programs for practicing surgeons.

Notwithstanding the support and contribution of my supervisors, co-authors, and supervisory committee members, the data presented in this thesis represents my original work.

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The views presented in this thesis are those of the authors and do not necessarily reflect those of the Royal College of Physicians and Surgeons of Canada.

AUTHOR CONTRIBUTIONS

I have made substantial contributions to all the manuscripts in this thesis. Original research questions and all stages of the studies were developed in collaboration with my thesis supervisors, Dr. Carmen Mueller and Dr. Gerald Fried. The individual contribution of the co-authors for each manuscript is described below:

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Author of this thesis, principal author of manuscripts I – IV, involved in all stages of the research presented (study conception, design, data acquisition, analysis, and interpretation of data) and drafting of manuscripts.

Dr. Carmen Mueller (Manuscript I-IV)

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Data analysis and manuscript revision.

Isabel A. Salmones, GD (Conceptual model)

Illustration design.

LIST OF ABBREVIATIONS

CME	Continuing medical education
CPD	Continuing professional development
ERAS	Enhanced recovery after surgery
OR	Operating room

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PREFACE

This thesis, presented in a manuscript-based format, includes four multi-authored manuscripts published or submitted for publication in peer-review journals. The first manuscript was presented as a poster at the 2018 Canadian Association of General Surgery Meeting and published in the *Journal of Surgical Education* in 2020. The second manuscript was presented as a podium presentation at the SAGES 2020 Annual Congress and was published in *Surgical Endoscopy* in 2020. The third manuscript has been accepted as a poster presentation at the SAGES 2021 Annual Congress and will be submitted for publication in *Surgical Endoscopy*. Finally, the fourth manuscript will be submitted for publication in *Surgical Endoscopy*. The framework and conceptual model are the final contribution of this work and have been compiled using data from all four manuscripts.

This thesis contains an Introduction and Summary chapter, as well as short preambles connecting one manuscript to the next. In addition, each manuscript has its own reference list and Tables, Figures, and Appendices. The master reference list at the end of the thesis pertains to the Introduction and Summary chapters only.

CHAPTER I. INTRODUCTION

Today, surgical education is still loosely based on the apprenticeship model that Dr. William Halsted popularized in the United States at the turn of the 20th century.[1] His model was based on the German system and was strictly pyramidal. The well-known adage "see one, do one, teach one" had its origin in this model and was based on training surgeons that would eventually become competent and be able to operate without supervision.[2,3]

Surgery is unique because it requires the mastery of knowledge and the ability to interpret it and apply it in the operating room. Residents are provided with feedback and guidance in the hopes of achieving proficiency before graduation.[4] However, once formal training finalizes, and life-long learning begins, surgeons are left to explore new skills and improve their competency, mainly on their own. On this note, to support life-long learning, continuing medical education (CME) was born. However, current continuing professional development modalities (CPD) lack the principles of feedback and guidance in which surgical education was founded. To understand how we can improve CPD, it is relevant to explore the adult learning theories on which lifelong learning for surgeons should be based.[5]

Adult Learning Theories

When discussing adult learning theories, the conversation almost always veers towards andragogy. The term andragogy was first used in 1833 to describe the educational theory of Plato, ἀνδρ- andra- means "man" and ἀγωγός- agogos- means "learning."[6] In the

1960's, Knowles further elaborated on the concept and asserted that andragogy should be differentiated from pedagogy. Knowles' andragogy concept was defined as "the art and science of helping adults learn."[7]

Knowles introduced six assumptions that make up the philosophy of andragogy:[8]

1. The learners' need to know.

2. The learners' self-concept.

3. The learners' experience.

4. The learners' readiness to learn.

5. The learners' orientation to learning.

6. The learners' motivation.

Although Knowles' ideas were the glue that unified the field of adult education[9], there are several other learning theories and understanding the concepts behind them is essential. Theories critical for the development of CPD can be grouped into instrumental learning, humanistic learning, transformative learning, and social learning theories.[10,11]

Instrumental learning theories focus on individual experience and promote autonomy as a central character in adult education. For these theories, learning is individualistic in nature.[10,12] In this group, we can find the experiential learning theory, which believes adult learners organize past experiences to facilitate learning.[10,13] In a way, this group of theories situates the learning in a real-world context. Kolbs described experiential learning as having four phases: concrete experience, reflective observation,

abstract conceptualization, and active experimentation.[14] These groups of theories also believe that specific stimuli can change the adults' behavior.[15]

The humanistic learning theories suggest that adults can plan, conduct, and evaluate their learning. They emphasize autonomy and individual freedom. It looks at the learner as the primary focus, but fails to see the social context in which learning takes place.[10] These theories are student-centered, and educators become facilitators. Knowles' philosophy of andragogy and the self-directed learning theory are prominent among this group.[15] Their individualistic views in an otherwise collaborative environment limit the extent of these theories.

Transformative learning theories focus on how one's beliefs are examined and changed; it is the process of becoming aware of how and why we perceive the world as we do[10]. Learning occurs when new knowledge becomes integrated into existing knowledge.

Social learning theories recognize that learning is a social activity structured by the tools available and influenced by the setting in which it takes place.[10]

When put together, there are several important concepts to understand from these theories:

1. Feedback, self-assessment, and self-reflection play a key role in learning.
2. The social aspect of learning and the influence of the environment, personal factors, and behavior[16] are important.
3. New information is interpreted using past knowledge and experience; adults will rework the information based on the perspectives they have.[17]

4. Adults work harder if they feel the goals set are worth starting and maintaining, and if they control what they learn.[18]

5. Adults can self-direct, self-manage, and self-motivate to learn.[19-21]

6. Role modeling plays a vital role.[22] A role model is not a teacher but a guide.[17]

7. Learners use the knowledge in real-world situations to form new experiences and grow professionally.[23]

The underpinnings of adult learning theories are meant to be flexible, adaptable, and used in parts, as a whole, individually, or grouped when incorporated into learning programs.

Continuing Professional Development

Surgery and medicine are constantly changing. Knowledge, skills, and technologies emerge at a fast pace. The requirements to maintain competence, achieve expertise, and improve patient outcomes are based on a continuous uptake of knowledge. In the late 1940s, the American Academy of Family Physicians required that each member adhere to specific learning modalities compiled under the term continuing medical education (CME).

The original assumptions for CME were: (1) that physicians were able to self-assess their learning needs and direct their learning, and (2) to maintain and increase professional competence with the idea that they could change and improve their practice to deliver better patient care.[24,25] Thus, CME models have since become an adjunct to practice, something of an "add-on" to daily life, such as attending a conference. However, this type of approach focuses on group learning and not outcomes, so despite compliance with CME

requirements, gaps continue to exist between what physicians know (competence) and what they do (performance).[25]

In the last years, there has been a shift from CME to continuing professional development (CPD), and while the terms have been used interchangeably, there are important differences between them. There is no sharp division between the two definitions, but the latter includes the competencies necessary to practice medicine and the multidisciplinary practice of treating a patient with social, managerial, financial, and personal skills, among others.[26,27] The World Health Organization has stated that CME systems should develop lifelong skills and competencies, be relevant to each physician's practice, address individual needs, and include continuous assessments of performance,[28] all key components of adult learning.

CPD modalities can be didactic or interactive. Interactive models allow for dialogue, discussion, questioning, clarification, or correction after a didactic lecture.[29] The most commonly used techniques, such as didactic lectures, have been shown to have the least benefit for practice change.[30] The Agency for Healthcare Research and Quality report found that multimedia use may have positive short and long-term effects on practice, and the more multimedia techniques used together, the more beneficial they become.[31]

Despite the proliferation of CPD methods, they often fail to lead to meaningful changes in practice, particularly concerning operative techniques and technical skills. One study reported a change in practice was close to 0% after attending didacticCME's.[32] CME activities have also gained criticism because of their teacher-centered, episodic, didactic approach.[33] Surgeons continue to report unmet educational needs, and knowledge

delivered in such forms has repeatedly been shown to, by itself, be insufficient to bring change in physician behavior and patient outcomes.[24,25,34-36] One survey reported that even though traditionalCME's can be ineffective, the five top reasons physicians still attend are to maintain professional competence, learn new knowledge, improve understanding of concepts, eliminate clinical deficiencies, and reassure themselves that they are doing "it" right.[33]

Several studies over the years have reported that interactive learning with opportunities to practice lead to change, and several sequenced activities lead to at least 50% long-term effectiveness, while didactic sessions on their own are unlikely to do so.[30,31,34,37-41] A review of 50 randomized trials reported that visits to practices sites and patient-related programs were positive CME interventions.[42] Individualized performance feedback aligned with the learner's particular goals seems to lead to real and durable changes in surgical practice.[43,44] According to Kane, allocating at least 25% of the time to interactive learning can change an activity's educational focus and outcomes, enhancing the quality of healthcare.[29]

We know that learning requires practice, experience, reflection, motivation, intrinsic drive, and critical analysis. Also, learning must be based on personalized goals and tailored to past experiences with direct applicability to daily activities. Thus, for continuing medical education programs to be successful, they should ideally provide individualized learning opportunities to deliver high-quality care within each physician's practice.

Coaching

The first use of the word "coach" in a similar context as we use it today dates back to 1830 from Oxford University. The word coach was used to refer to a"tutor who carried a student through their academic work."[45] Coaching became an essential part of sports in the 1860s, but it was not until the 1940s that the business and psychology world became interested.[46]

According to Sir John Whitmore, coaching is "unlocking a person's potential to maximize their performance. It is helping them learn rather than teaching them . . ." [47] Effective coaching uses key characteristics drawn from the adult learning theories I have previously described. Executive coaches believe coaching may be considered in an adult learning context[48]. In this context, coaching uses instrumental learning theories by situating the coachee and their goals in real-life situations. Andragogy's assumptions become the coaching mindset. The social learning theories suppose that behaviors influence the coach-coachee relationship and the bidirectionality of learning. Furthermore, the humanistic theories believe that the coachee will take the initiative and drive the agenda with their own goals for learning. [48] Table 1 describes the principles of adult learning and their associated elements of coaching.

Table 1.1 Adult Learning Theories:Coaching

Adult Learning Theory	Characteristic	Coaching Element
Andragogy	Self-concept and self-direction	Feedback should respect the coachees' autonomy
	Need to know	The coachee drives the agenda
	The role of experience	The coachees' background and experience drive the learning process
	Readiness to learn	Coachees' seek to learn to understand something new that is relevant to their life
	Orientation to learning	Coachees' engage in activities that they can use
	Motivation to learn	Coaching embraces life-long learning
Experiential learning theory	Learning cycle	GROW (Goal, Reality, Options, Will) model
Transformative learning theory	New knowledge transforms thinking	Questioning techniques have the potential for transformation of knowledge

Social learning theories	Focuses on the social interaction and desired behavior as learning facilitators	The coach-coachee relationship is situated within a broader social context
Self-directed learning	Learners take responsibility for their own decisions	The coachee drives the agenda

[48-51]

Differences Between Coaching, Teaching, and Mentoring

Coaching can frequently be mistaken for mentoring; however, these two relationships are quite distinct. A mentor can guide personal and professional issues with no time limitations and often does not involve structured goal setting.[52,53] Furthermore, proctoring involves an experienced person judging the performance of another to provide credentials or grant practice privileges. Teaching focuses on specific lessons, usually cognitive, and requires instruction, not guidance, and evaluation.[54] In contrast, coaching addresses specific areas for improvement by using personalized, predefined goals and provides non-judgmental feedback and formative assessment according to the goals and a predefined timeline.[55]

Surgical Coaching

Most of the research and information available comes from executive and sports coaching but can be easily translated into medicine. Coaches are an essential part of sports,

and recently executive coaches gained momentum in business. The common misconception of a sports coach is that their role is mainly on the sidelines calling all the shots and pushing for a better performance from the athlete. However, a sports coach's job is much broader, and what is seen on the sidelines is the proactive approach or the managerial part of the process. Like executive coaching, sports coaching is generally based on the athlete's needs and the background of the coach.[56]

Although surgical coaching is not entirely new, it has gained momentum as a continuing professional development modality in the last few years. In 2011, one surgeon's editorial opinion in The New Yorker proposed the idea of surgeons having coaches.[57] The original idea was taken from and has been compared to professional sports coaching.

Tools used by sports coaches play a big part in the success of athletes. Detailed monitoring helps identify strengths and weaknesses, allowing for structured programs with specific goals to be developed.[58] Sports and executive coaching have taught us that "coaches are always learning, and this learning comes from rigorous inquiry,"[56] the ability to observe is essential, there must be clear goals that can be translated into improved results, and the coach-coachee relationship is based on trust, respect, and commitment to work towards one goal.[59,60]

A great surgical coach maximizes the surgeon's potential and creates an environment that abides by the adult learning theories.[61] Surgical coaching involves a surgical expert observing the performance of another and providing objective and formative feedback. If this is done correctly, the coach encourages the surgeon to reflect on their performance and to accomplish self-determined goals.[62,63]

Currently, there is not a published standardized definition for surgical coaching. However, it may be defined as "a process whereby an experienced and trusted role model, advisor, or friend, guides another individual in the development or self-reflection of ideas, learning, and professional development, working with mutual goals, and providing support for changes in practice."[64-68] According to the Coaches Training Institute, coaching is an activity that brings forth knowledge, wisdom, and insight.[69] A coach may provide an outside viewpoint that the coachee may not see on their own.

Surgical coaching has been shown to positively affect achievement compared to other types of learning and nurtures positive interdependence and personal accountability.[52,62,65,68,70,71]

The Wisconsin Surgical Coaching Framework was the first framework entirely focused on coaching for surgery. It describes four specific activities that all coaching programs should possess: 1) setting goals, 2) inquiry, 3) constructive feedback, and 4) action planning.[70,72]

The first step in developing a coaching program is to establish the need for coaching. All program participants should be trained before participation. Being a great surgeon is not necessarily a synonym for being a great surgical coach. Coach training should include developing a coaching mindset and the four essential coaching activities using the pre-established models from other professions.[73-75] Like in sports,[59] a great surgical coach will bring a holistic approach to the process.

From the world of executive coaching, we know that sessions should be conducted according to the GROW (Goal, Reality, Options, Will) model.[76] The key to a successful

coaching program is to spend sufficient time establishing and exploring the goals. Goals should be flexible and revised as needed; they should also be specific, measurable, appropriate, realistic, and timely (SMART).[77] Participants should assess their current situation (reality) and clarify which actions have been taken so far; this can be done in the OR or with video analysis. The next step (options) is to establish the possibilities and alternatives to move forward. These last two steps are the base where self-reflection and insight are established. The last step is to understand what has been learned, how the initial goals can be changed or recommit to them, to highlight the achievement, and create a plan of action.

Coaching schedules are typically adapted between each pair. No consensus has been reached on how many interactions are needed to have a successful program but, if CPD research is correct, more than one is needed.[31,68]

Peer Surgical Coaching

Peer coaching is a distinctive type of coaching used when participants have a similar level of knowledge or skill. In this model, peers engage in an equal, non-competitive relationship that involves observation and feedback to improve and support the implementation of change. While coaching in this model may be reciprocal, it may not necessarily be balanced equally depending on the individual skills and goals of participants.[52,63,72,78,79]

Peer coaching has certain advantages over other models as peers are more likely to understand the pressures faced and will often have methods for overcoming them[53].

Therefore, the success of peer coaching lies in establishing a relationship of mutual trust, commonality, compatibility, and credibility.[7,72] The main tenents of peer coaching are that it must be voluntary, mutually beneficial, and non-evaluative.[65,80] One study found that surgeons participating in coaching alternated between roles so that the exchange of ideas became bidirectional, and each surgeon offered their expertise.[73]

Relationship dynamics

Evidence as to what constitutes a good surgical coach or coachee is limited. It is believed that surgical coaches should have high emotional intelligence, excellent communication skills, and be respected amongst their peers.[70] Coaches should also be able to put aside hierarchical roles, be active listeners, "empower" the coachee, and show enthusiasm for their goals.[68,81,82] One study transferred skills from long-run coaches to medicine and concluded that some characteristics required were being keen observers and modeling the qualities sought to be instilled.[83] The characteristics of a good coach are generally understood to be part of personality traits, but coaching may not come naturally to all surgeons. The best way to cultivate the skills needed is still not clear. The Academy for Surgical Coaching has established a Surgical Coaching Workshop to train surgeons on becoming effective surgical coaches, which has been well accepted by practicing surgeons.[84,85] The curriculum includes practical communication tips, such as listening, questioning, demonstrating empathy, maintaining a partnership mentality, role-playing, establishing goals, observation, and feedback.[85] The Wisconsin Surgical Coaching Rubric for assessing coach performance in a coaching session has been validated and may now be

used to assess fidelity of coaching sessions and provide feedback to coaches.[86] Good coach-coachee relationships are based on building rapport, cultivating mutual trust, building a partnership, aligning roles and expectations beforehand.[82]

Barriers

While in situ coaching may provide better opportunities for improving all aspects of operative practice, time constraints, geographical distances, remuneration, and fear of humiliation or judgment have been cited as barriers to its widespread implementation.[68,75,87] In addition, other barriers such as a perceived lack of need and dynamics in the coach-coachee relationship, such as hierarchy, ego, and not establishing rapport, have also been reported.[75]

Despite the barriers, when implemented correctly, coaching has been shown to stimulate lasting change in surgical skills, practice, and patient outcomes.[72,88]

Negative Side Effects

Although surgical coaching is generally highly rated by participants,[68] there have been reports of negative side effects to coaching. Poor coaching has led to negative effects in coachees in areas such as psychological health, social integration, performance, motivation, and competence.[89] This confirms the need for high-quality, trained coaches in surgery.

While the deficit for life-long learning and change in practice has been acknowledged, there is a lack of literature evaluating the need for, opinions of, desired structure of, and real-life encountered barriers to surgical coaching. Most of the published literature in surgical coaching has examined interventions using "experts" to coach other participants with prerecorded videos. Additionally, peer surgical coaching has gained momentum as a potential tool for skill improvement and life-long learning, but participation remains low. Therefore, there is a need to explore the surgical profession, in particular, to understand their needs and desires as it pertains to this new modality.

THESIS OBJECTIVES

1. To systematically review the available peer-reviewed literature regarding the use of, need for, and barriers to peer-based coaching for continuous professional development among practicing surgeons.

2. To explore the needs for, barriers to and optimal characteristics of coaching as a means of continuous skill refinement for surgeons in practice

3. To determine how peer coaching is perceived and explore the optimal characteristics desired internationally

4. To develop, implement, and evaluate the feasibility of a reciprocal peer coaching pilot program for practicing surgeons in various career stages and practice settings.

5. To assess the satisfaction and opinion of the surgeons about the reciprocal peer coaching program and its implications in practice.

The core aim of the research project contained within the thesis was to develop a "Surgical Coaching Conceptual Model." Given the multistep nature of this work, it has been divided into four manuscripts. At the end, I present a one-page graphical conceptual model describing the relationship between the needs and barriers to surgical coaching.

CHAPTER II. DETERMINING CHARACTERISTICS AND EFFECTIVENESS OF PEER SURGICAL COACHING

2.1 Preamble

The need for ongoing skills development in surgery is well recognized. Surgical training is based on the apprenticeship model, in which residents rely on deliberate practice and feedback from a senior to achieve proficiency. The need for personalized feedback to improve surgical skills once training has ended is now recognized and accepted but does not happen often. In the past few years, there has been an emergence of coaching programs for surgeons to meet that need. However, the variation between programs and even the definition of coaching is vast. Most literature focuses on the importance and outcomes of coaching for trainees.

Thus, the objective was to systematically review the available peer-reviewed literature regarding the use of, need for, and barriers to peer-based coaching for continuing professional development among practicing surgeons.

In this manuscript, we conducted a systematic review to determine and synthesize the available literature regarding coaching for practicing surgeons. This systematic review was registered in Prospero,[90] and health librarians conducted the search strategy. Since there is still a misuse of the term coaching, and it tends to be used interchangeably with mentoring, our search strategy included both terms. We compiled several definitions found in the literature and developed a concrete definition to guide our review and future research. We also focused on identifying implementation characteristics, effectiveness, and the opinions of surgeons on coaching programs.

2.2 Manuscript 1: Implementation and Effectiveness of Coaching for Surgeons in Practice. A Mixed Studies Systematic Review.

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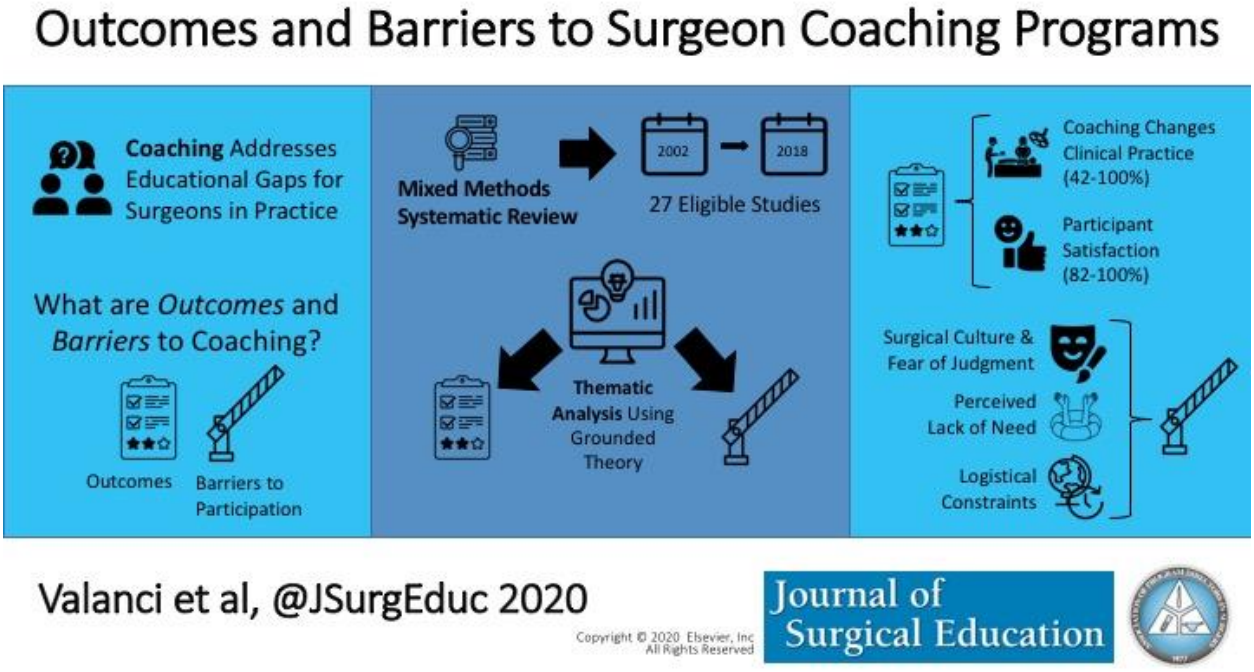

Fig. 2.1 Graphic Abstract

Abstract

Introduction. Despite recent changes to medical education, surgical training remains largely based on the apprenticeship model. However, after completing training, there are few structured learning opportunities available for surgeons in practice to refine their skills or acquire new skills. Personalized observation with feedback is rarely a feature of traditional continuing medical education learning. Coaching has recently been proposed as a modality to meet these educational gaps; however, data are limited, and few coaching programs presently exist. The purpose of this study is to summarize the characteristics of coaching programs for surgeons in practice including participant satisfaction, program outcomes, and barriers to implementation, in the published literature.

Methods. A mixed studies systematic review was conducted according to PRISMA guidelines to identify all original studies describing or investigating coaching for practicing surgeons up to 06/2019. Quantitative analysis was used to summarize numerical data, and qualitative analysis using grounded theory methodology for descriptive data was used to summarize the results into themes across studies.

Results. After identification of articles, 27 were included in the final synthesis. Twenty-six articles described execution of a coaching program. Programs varied widely with 18/26 focusing on teaching new skills, and the remainder on refinement of skills. Thematic analysis identified 2 major data categories that guided deeper analysis: *outcomes of* and *barriers to* coaching. Of the 16 (62%) programs that reported outcomes of coaching, 42% to 100% of participants reported changes in clinical practice directly associated with coaching. Positive satisfaction after completion of a program was reported by 82% to 100%

of participants. Reported barriers to participating in a coaching program emerged along 3 main themes: logistical constraints, surgical culture, and perceived lack of need.

Conclusions. Coaching for surgeons in practice is highly rated by participants and often results in clinical practice changes, while cultural and logistical issues were identified as barriers to implementation. A better understanding of these factors is required to guide coaching program development and implementation.

Key words: coaching, surgery, practicing surgeons

Competency: Medical Knowledge, Interpersonal and Communication Skills, Practice-Based Learning and Improvement

Introduction

Despite recent changes to medical education, surgical training remains largely based on the apprenticeship model in which senior practitioners provide trainees with focused practice opportunities and timely feedback.[1] This forms the basis of the deliberate practice model, which is widely recognized as necessary for the development of expertise across numerous disciplines.[2] Increasingly, deliberate practice is considered vital during surgical training for the development and maintenance of competence to perform operations independently.[2]

Once training ends, however, very few structured opportunities to work longitudinally with a knowledgeable coach exist for surgeons in practice.[3] The need for continuing medical education (CME) is well recognized in surgery but these activities mostly take the form of attending lectures, reading journals, participating in short hands-on courses and watching edited videos: activities which are usually passive, expensive, lack interaction, are not in situ, and are generally not geared to the needs of adult learners.[4, 5, 6, 7] Absence of external feedback over time has been associated with performance decline in many disciplines, including surgery.[1] Furthermore, well-established adult learning theories support that practice, experience, reflection, critical analysis, and goal setting are necessary for the acquisition and retention of knowledge and skills. Yet, opportunities for surgeons in practice to participate in such CME modalities are lacking.[2,8,9]

In this context, peer coaching has been proposed as a means to address the educational need for ongoing skill refinement and acquisition for practicing surgeons.[10,11] Coaching belongs to the co-operative learning paradigm[12] and has been shown

to have positive effects on achievement when compared to purely didactic learning modalities.[10,13] Moreover, coaching allows for optimization of feedback and self-reflection, activities which are important in the continuous improvement of technical skills.[14] The delivery of formalized feedback for the purpose of helping the coachee meet self-defined goals distinguishes coaching from mentoring, which involves informal advice given without specific goals in mind.[13,15]Recent studies have reported successful knowledge and skill acquisition and high participant satisfaction through peer coaching models.[16] Despite the success of these programs and the recognized need for ongoing deliberate practice to maintain expertise, few coaching programs presently exist for surgeons in practice. An understanding of the impact and limitations of coaching programs for surgeons may suggest strategies to enhance coaching utilization.

The purpose of this study is to summarize the characteristics of coaching programs for surgeons in practice including program structure, outcomes, and barriers to implementation

Methods

We conducted a mixed-studies systematic review by including different design studies (quantitative, qualitative, and mixed methods).[17,18] By using this type of study, important information is not overlooked, and it combines the strengths of quantitative and qualitative methods.[17]

Definitions

For this review, coaching was defined as "a process whereby an experienced and trusted role model, advisor, or friend guides another individual in the development or self-reflection of ideas, learning and professional development, working with mutual goals, and providing support for changes in practice."[13,19, 20, 21] Surgeons were defined as medical doctors with specialist licensure in one or more of the following disciplines or subspecialties regulated by the Royal College of Physicians and Surgeons of Canada: general, cardiothoracic, vascular, neurosurgery, urology, obstetrics/gynecology, otolaryngology, orthopedics, and plastic surgery.[22]

Search Strategy

The following databases were searched for relevant studies: MEDLINE (via Ovid 1946 to 15/Mar/2017; via PubMed 1946 to 15/Mar/2017); Embase Classic + Embase (via Ovid 1947 to 15/Mar/2017); BIOSIS Previews (via Ovid 1969 to 2017 Week 16); Global Health (via Ovid 1973 to 2017 Week 09); The Cochrane Central Register of Controlled Trials (via The Cochrane Library, to issue 2 of 12, February 2017) and Web of Science (via Thomson Reuters). The search strategy used text words and relevant indexing to identify studies assessing the impact of coaching and mentorship on skill and practice improvement among practicing surgeons after the end of formal training. The full MEDLINE strategy (Appendix 1) was applied to all databases, with modifications to search terms as necessary. No language limits were applied.

ClinicalTrials.gov (www.clinicaltrials.gov/ 08/May/2017), the ISRCTN Registry (http://www.isrctn.com/ 12/May/2017) and the International Clinical Trials Registry Platform (http://apps.who.int/trialsearch/12/May/2017) were also searched to identify research in progress. Further reports were identified in Web of Science and Scopus (24/Apr/2018) by carrying out by citation searches for studies citing included studies, as well as by examining their reference lists. Finally, all strategies were rerun prior to submission to ensure no newly published articles were missed.

Article Selection

Articles were screened and selected according to the PRISMA guidelines for systematic reviews.[23] Articles describing structured observations of performance with feedback by an expert with a focus on technical or nontechnical skills were included. Substudies of larger coaching programs that added additional information regarding program design, outcomes, or barriers not previously described in the parent study were also included. Articles involving trainees (residents, fellows, or medical students), nonstructured learning, or repetition without expert feedback were excluded, as were conference abstracts, commentaries, or editorials. Two authors (SV and NA) independently assessed the eligibility of bibliographic records. All conflicts were resolved via a discussion between the 2 reviewers. In the event a conflict could not be resolved, a third author (CM) served as a tie breaker.

Data Extraction and Qualitative Thematic Analysis

Data extraction was independently performed by 2 authors (SV and NA). Articles were categorized according to the characteristics of coaching activities, reported outcomes, and participant feedback. A data-based convergent synthesis design was used to collect and analyze data in a parallel manner[24] such that data integration occurred during collection and analysis. A thematic analysis of the included studies was developed during data collection, leading to data being categorized into study format, outcomes, and reported barriers to coaching.[25] Grounded theory methodology[26] was used to identify participant response characteristics and to organize these into overarching themes. Coding was done until thematical saturation was reached with no new themes or categories were identified.Since raw data of participant responses was often unavailable, identification and grouping of the themes already analyzed and defined in each paper was used to synthesis the results. Heterogeneity of data precluded meta-analysis; thus, data were summarized using descriptive statistics and are reported as number (percent).

The research protocol is registered in PROSPERO for public access: CRD42018090516[27] and was approved by the Institutional Review Board at McGill University.

Results

Study Characteristics

A total of 5020 unique citations were identified after duplicates were removed, of which 27 met the inclusion criteria and were included in the final synthesis (Fig. 2.2). Of

the 27 articles included, 15 (56%) were prospective studies, 7 (26%) retrospective studies, 4 (15%) qualitative studies, and 1 (3%) randomized controlled study. The majority (26; 96%) originated from the United States, Canada, and Europe, and all were published between 2002 and 2018. Participants were specialized in general surgery (15;56%), urology (8;30%), gynecology (3;11%), and cardiothoracic surgery (1; 3%).

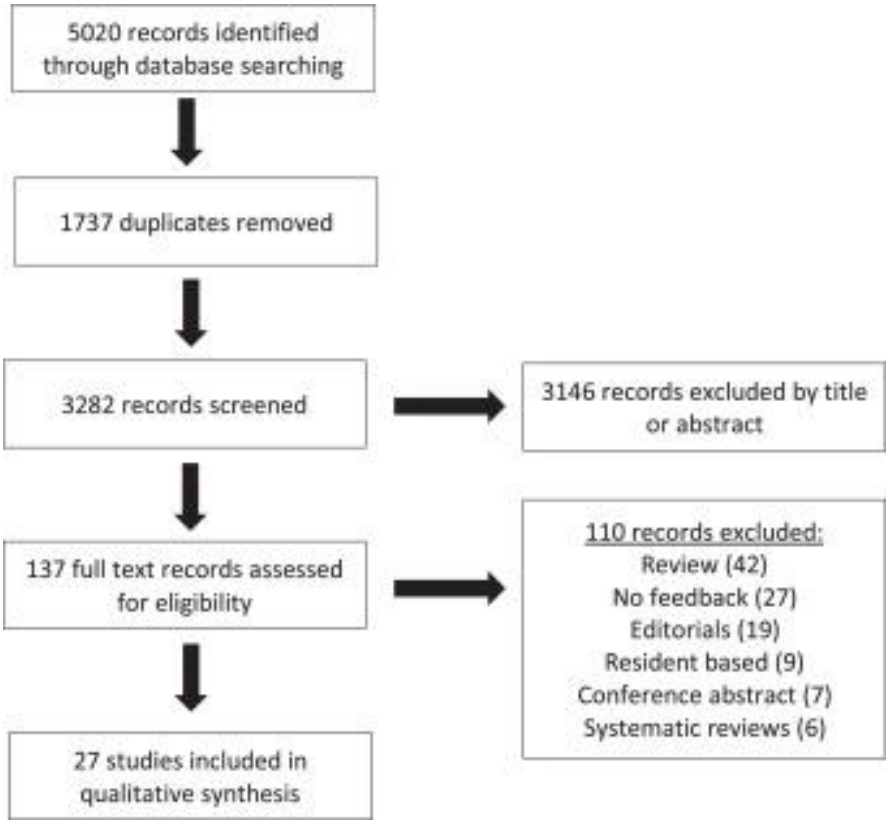

Fig. 2.2 Flow diagram of records screened and included for analysis

Twenty-six articles (96%) involved execution of a coaching program while 1 (4%) examined perceptions to coaching through qualitative analysis of semistructured interviews. Structured coaching programs varied widely, with 18/26 (70%) focused on teaching new skills and the remainder on refinement of existing skills. Two of 26 programs

(8%) involved coaching nontechnical skills (such as judgment, decision making, and team management) in addition to technical skills.[14,28] Of the 26 structured programs, all but 1 involved unidirectional feedback in which participants received coaching from predefined experts.[29]

Coaching Program Structure

Coaching programs were mostly a combination of simulation, wet and/or dry labs and operating room coaching in 19 programs, [30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48] while other modalities (video, phone calls, web calls, and workshops) were used in 7 cases.[16,28,29,49, 50, 51, 52] In all studies, coaches had more expertise in the task being implemented than those being coached, most studies appointed coaches based on peer nomination, although a few of them selected coaches based on experience in years and number of cases,[28,42] and 5 of the studies also asked coaches to take a course before being able to coach.[14,34,46,49,50]Despite this, all studies utilized a peer coaching approach, in which coaches and coachees were at similar levels in their professional lives, notwithstanding different levels of proficiency in the task or skill under study.[51] Program length was reported in 20/26 (77%) of structured studies and varied widely from 1 hour to 4 years (median: 6 months).

Of the 26 structured programs, the exact number of interactions in 13/26 were not reported but rather described as "multiple" or "individualized" with the interactions continuing until competence was achieved.[31, 32, 33,37, 38, 39,41, 42, 43, 44, 45, 46,48] Nine of 26 structured studies reported the number of interactions which varied from 1 to 5 (median: 2

interactions)[16,28,29,34,36,49, 50, 51, 52] and 4/26 structured studies did not describe the number of interactions needed to achieve program completion.[30,35,40,47] The programs that described a finite number of interactions were mostly structured so participants would meet to either establish particular goals (2/9)[16,52] or work on pre-established goals (e.g., through workshops) (7/9)[28,29,34,36,49, 50, 51.] Each program had different goals and prerequisites for completing it. Structure of included studies is presented in Table 2.1.

TABLE 2.1. Coaching Program Structure

Author	Target Speciality	Number of Coaches	Recruitment Criteria	Number Coachees	Recruitment Criteria	Course Completion Rate	Program Characteristics				
							Coach Training	Interaction Type	Length of Interve-ntion	Number of Interac-tions	Goals
Briet[30]	Gynecology	2	Specialist in laparoscopic surgery	11	Voluntary, interest in laparoscopic surgery, experience in level 2 laparoscopy	100%	NA	Digital video introduction, laparoscopy workshop and OR coaching	1 y	NA	Safe implementation of advanced laparoscopic techniques
Birch[35]	General surgery	1	Fellowship trained advanced MIS surgeon	7	NA	100%	NA	OR coaching	1 y	NA	Completition of advanced MIS cases
Chou[36]	Urology	NA	NA	16	NA	100%	NA	Didactic sessions, skills training sessions, animal and cadaver lab and OR coaching	5 d	2-3	Transfer of new surgical skills
Cook[33]	Pediatric urology	1	Expert mentor	4	NA	100%	NA	Didactic lectures, pelvic trainer, porcine models and OR coaching	10 mo	Non specific	Teach advanced laparoscopy
Dort[50]	General surgery	5	Known field expertise, willingness to participate, commitment	10	Pool Hands-On Hernia Course	60%	Completed 1.5 days Lapco TT course	Hands-on course at SAGES, phone conferences coach-coachee and web-based coaching sessions	1 y	1	Increase transfer of training to clinical practice
Dort[49]	General surgery	NA	Faculty completed standarized "intraoperative" course	20	Pool Hands-On Hernia Course	85%	Completed intraoperative teaching course structured on Lapco TT	Hands-on course at SAGES, phone conferences coach-coachee and	1 y	1	Increase transfer of training to clinical practice

Author	Target Speciality	Number of Coaches	Recruitment Criteria	Number Coachees	Recruitment Criteria	Course Completion Rate	Program Characteristics				
							Coach Training	Interaction Type	Length of Intervention	Number of Interactions	Goals
								web-based coaching sessions			
Farhat[31]	Pediatric urology	1	Expert mentor	4	Pediatric urologist no formal laparoscopic training	100%	NA	Lectures, pelvic trainer and animal courses, OR coaching	10 mo	Non specific	Teach advanced laparoscopy
Gagliardi[32]	General surgery	7	SNL was choosen by sponsor. LAP nominated by peers	25	Voluntary	92%	No training	Single, one-on-one sessions in OR coaching	6 mo	Non specific	Learn or improve technical skill
Greenberg J[34]	General surgery	3	Peer nomination: expertise, comunication skills, willingness and availability	3	Voluntary	66%	4-hour coaching session	Reading material and videos, didactic sessions, video review, simulator, OR coaching, video review 10 independent cases	5-7 mo	3	Personal goals
Greenberg C[16]	General surgery	8	Peer nominations, surgeons with technical and interpersonal skills	12	Voluntary	92%	4-hour coaching session	1-hour video review session, coaching session based on goals 1-month after	12 mo	1-3	NTS, personal technical goals
Gupta V[37]	Pediatric urology	1	NA	1	NA	100%	NA	Short lecture, OR coaching	5 d	5	Teach specific laparoscopic skills
Hu[29]	General surgery	1	Highly respected, recently retired surgical	4	Voluntary	100%	No training	1 hour video review complex laparoscopic case	1 h	1	Review and improve operative performance

(continued on next page)

Author	Target Speciality	Number of Coaches	Recruitment Criteria	Number Coachees	Recruitment Criteria	Course Completion Rate	Program Characteristics				
							Coach Training	Interaction Type	Length of Interve-ntion	Number of Interac-tions	Goals
			oncologist, extensive expertise								
Keeley[40]	Urology	4	Experienced surgeons	39	NA	100%	NA	Dry lab, wet lab, observ-ing procedure at coach's hospital, OR coaching	NA	NA	Complete inde-pendent surgery
Leung[41]	Gynecology	3	Confident and competent surgeon and teacher	9	Voluntary	100%	teach the teacher training	OR coaching	1 m	Non specific	Facilitation of surgical coaching in the OR using a structured template
Mansel[46]	Breast surgery	NA	Accredited sur-geon, partici-pants UK ALMANAC trial	210	SLNB naive surgeons	68%	Training the Trainers course	1 day theory course, OR coaching	NA	Non specific	Adoption of sentinel lymph node biopsy
Mar-guet[47]	Urology	NA	NA	56	NA	50%	NA	Didactic lec-ture, porcine model train-ing, OR coaching	NA	NA	Gain funda-mental under-standing of laparoscopic techniques
McA-rthur [39]	General surgery	1	Colorectal sur-geon post fellowship	2	NA	100%	NA	OR coaching	10 mo	Non specific	Train consultant colleagues in laparoscopic surgery
Mussa[42]	Cardiac surgery	1	Senior surgeon, >4 years in practice	3	NA	100%	NA	OR coaching	6-12 mo	Non specific	Teach complex surgical procedures
Mutabd-zic53**	General surgery	NA	NA	14	Voluntary	100%	NA	Interviews	NA	NA	Explore con-cerns of coaching
Palter V[51]	General surgery, gynecology	1	Advanced fel-lowship in MIS	20	Voluntary	90%	Introduction to the coaching framework	Video coaching	1 h	2	Teach lap sutur-ing to faculty
Rané[48]	Urology	NA	NA	9		100%	NA		NA		

Author	Target Speciality	Number of Coaches	Recruitment Criteria	Number Coachees	Recruitment Criteria	Course Completion Rate	Program Characteristics				
							Coach Training	Interaction Type	Length of Interve-ntion	Number of Interac-tions	Goals
					Urologist com-pleted train-ing animal laboratory course			Pelvic trainer, OR coaching		Non specific	Facilitate inde-pendent lapa-roscopic urol-ogy practice
Rees[38]	General surgery	1	Experienced surgeon	11	Voluntary	100%	NA	OR coaching	1 d	Non specific	Establish lapa-roscopic colo-rectal service
Sebaj-ang[43]	General surgery	1	Expert laparo-scopic sur-geon from the center for min-imal access surgery	4	Community sur-geons no for-mal advanced laparoscopic training	100%	No training	Intraoperative telementoring	NA	Non specific	Transition safely and efficiently from open to laparoscopy
Shal-hav[44]	Urology	NA	NA	2	NA	100%	NA	OR coaching	6 d	Non specific	Teach laparo-scopic uro-logic surgery
Stefa-nidis[28]	General surgery, gynecology	3	Surgery: MIS >10 year experience, 350 opera-tions. OBGYN >25 year experi-ence, 200 operations	9	Performed 1 procedure twice in 6 month period	100%	NA	Video coaching	4.5 h	1	Improve defi-ciencies and train NTS
Twijn-stra[45]	Gynecology	1	Advanced lap-aroscopic gynecological surgeon affili-ated university	2	Interest in lapa-roscopy, experience in level 2 lapa-roscopic procedures	100%	NA	OR coaching	30-48 mo	Non specific	Implementation and mainte-nance of advanced laparoscopic skills
Weng-hofer[52]	Various	9	Preassessed, found to be exemplary, same area of medicine	41	Random pool of the CPSO	75%	Previously assessed and found to be exemplary	Telephone ses-sion establish goals	NA	3	Promote and support physi-cian learning

MIS: minimally invasive surgery; SNL: sentinel node lymph; LAP: laparoscopy, level 2 laparoscopy: in Gynecological surgery a level 2 laparoscopy includes all minor procedures (salpingectomy, adhesiolysis, myolysis, etc.), CPSO: College of Physicians and Surgeons of Ontario; SNLB: sentinel node lymph biopsy; NTS: nontechnical skills. **No intervention.

Thematic Analysis

During data collection and coding, a thematic framework was created to guide the categorization of findings. Data were grouped into 2 main themes: Outcomes of Coaching and Barriers to Coaching. The framework and relative prevalence of each central theme are depicted in Figure 2.3.

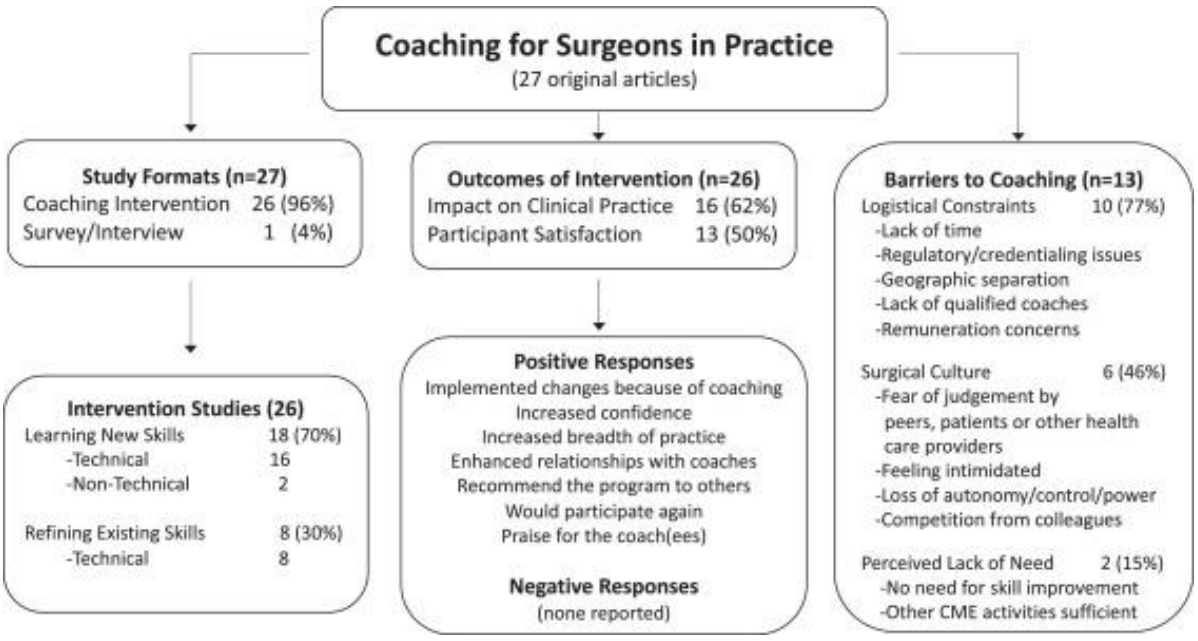

Fig. 2.3. Diagrammatic depiction of thematic framework used to guide data collection and relative prevalence of themes across included studies. Results are reported as *n* (%) for the number of articles in which the given theme was reported.

Outcomes of Coaching

No study objectively quantified the proficiency of coaches in the coached task, nor did any compare skills between coaches and coachees. Only 1 study compared performance between coached participants and a noncoached control group performing laparoscopic intracorporeal knot tying, in which greater technical proficiency was observed in the

intervention arm.[51] In the remainder of studies, success of the coaching intervention was measured exclusively through participant feedback after the intervention (Table 2.2).

Outcomes of coaching programs were thus grouped into 2 subthemes based on reported participant feedback. The first subtheme, *Impact on Clinical Practice,* was defined as practice changes enduring >1month after program completion. This outcome was reported by 16/26 (62%) of intervention studies. The percentages of participants reporting implementation of skills learned into clinical practice ranged across studies from 7/16 participants (43%) to 12/12 participants (100%). Self-reported increased confidence, increased breadth of practice and enhanced relationships with coaches were categorized during thematic analysis as having a positive impact on clinical practice. No negative outcomes on clinical practice were reported in any study. Examples of comments demonstrating practice changes as a result of coaching include:

"operating more complex hernias and… sublay mesh placement"[50]

"feeling more comfortable doing advanced laparoscopic cases"[32]

"after this study, I feel comfortable suturing in the operating room"[32] *"the best moves and steps that I was maybe lacking prior to this"*[32]

"I wanted to thank you for the learning session yesterday. I found it very helpful. I just finished my first 4 lap choles for today and found myself implementing several things we talked about yesterday. Look forward to continuing to work with you. Thanks for all your hard work on the effort"[28]

"increased awareness of incisional hernia repair options"[50]

The second outcome subtheme, *Participant Satisfaction* after completion of a structured program, was assessed in 13/26 (50%) of studies with the rate of positive responses reported ranging from 9/11 participants (82%) to 16/16 participants (100%). No studies reported negative participant feedback but 1 study "noted a predominant resistance toward coaching in surgery, with only a few participants expressing a positive attitude," but these observations were not further expanded upon in the paper.[53] Positive attitudes were also captured in 3 studies using qualitative interviews to determine surgeon opinions regarding coaching [16,29,32]. Examples of statements categorized as positive participant feedback include:

"I truly believe that this should be the model for practice development… I feel like normalization of the coach/coachee program would be beneficial to every surgeon"[16]

"recommend the program or would do the program again"[41]

"feedback from the evaluator was spectacular. The assessor was incredibly good in giving feedback-both positive and negative"[52].

"you can apply what you're learning right then and there and it tends to stick a little better"[32]

"the concept of continual self-improvement is a very valuable tool in our rapidly changing healthcare environment – work and research such as this is very valuable…" [16]

"It was a wonderful experience to know that I had a forum where I could ask clinical questions… I feel that the mentorship provided… has helped me tremendously…"[49]

TABLE 2.2. Outcomes of Coaching Programs

Author	Task Coached	Debriefing (Y/N)	Evaluation Used	Program Outcomes	Impact on Clinical Practice (Y/N)
Briet[30]	Laparoscopic hysterectomy	NA	OSATS	Nine gynecologists had a passing grade during study and were considered competent	Y
Birch[35]	Advanced MIS gastrointestinal tract excluding bariatric	NA	Pre- and postintervention chart examination	Total number of advanced MIS cases increased, conversions to open surgery and intraoperative complications decreased	NA
Chou[36]	Ureteroscopy, percutaneous renal surgery, laparoscopic ablative surgery, reconstructive surgery or robot-assisted prostatectomy	NA	Timed skills testing, follow-up survey	Scoring significantly improved for threading suture through loops, laparoscopically novice participants now performed laparoscopic nephrectomy and participants with prior experience now performed advanced cases	Y
Cook[33]	Renal retroperitoneal laparoscopic procedures	NA	Mean operative time, complications, rational for conversion	After 2.5 of program completition, 2 coachees employ laparoscopy and consider it a tool in their armamentarium	Y
Dort[50]	Abdominal wall hernia repair	Y	Pre- and postintervention survey	"Over the 3 months following the course, ADOPT participants performed more ventral hernia mesh insertion procedures than standard training participants"	Y
Dort[49]	Abdominal wall hernia repair	Y	Program effectiveness with survey	"In the 9-month survey, significant increases in the annualized procedural volumes were reported for open primary ventral hernia repari, open components separtaion, and mesh insertion for ventral hernia repair"	Y
Farhat[31]	Renal, retroperitoneal laparoscopic procedures	NA	Mean operative time, complications, rational for conversion	After the program, 11 procedures were performed without complications, and a mean operative duration of 180 min	NA
Gagliardi[32]	Sentinel lymph node biopsy for breast cancer and laparoscopic colon resection	NA	Survey	Participants expressed program created awareness of a gap in knowledge, the perceived outcomes included a reduction in complications	Y
Greenberg J[34]	TEP	NA	Video recording review session, survey	At follow-up both participants have adopted and fully utilize as primary repair technique	Y
Greenberg C[16]	Goal based	Y	Written evaluation assessments, targeted interviews with the coaches	"Results suggest that participating surgeons found the coaching sessions to be valuable and were satisfied with the experience"	NA
Gupta V[37]	Pediatric laparoscopic orchidopexy	NA	Short-term operative outcomes	Coachee could indpendently manage cases (except for 1), all procedures were performed successfully without major complications	NA

Author	Task Coached	Debriefing (Y/N)	Evaluation Used	Program Outcomes	Impact on Clinical Practice (Y/N)
Hu[29]	Pancreaticoduodenectomy, radical resection of retroperitoneal sarcoma, subtotal gastrectomy	Y	Video recording coaching	Video coaching proved valuable for identification of specific procedural steps, participants reported making concrete practice changes	NA
Keeley[40]	Urological laparoscopy	NA	Standard data to evaluate experience 10 years post course	74% urologists were able to begin independent practice in laparoscopy	Y
Leung[41]	Gynecological complex surgeries	Y	OREEM, satisfaction survey	"Surgeons appreciated the refinement of their surgical technique and opportunity to learn useful teaching skills"	Y
Mansel[46]	Sentinel lymph node biopsy for breast cancer	NA	Validation standards	Surgeons met the localization standard of at least 90% within 30 cases	NA
Marguet[47]	Hand assisted laparoscopy	N	Follow-up surveys	"Respondents who completed the course and underwent mentoring by a course instructor were more likely (93.1%) to perform laparoscopic cases after 6 months of follow-up than those who were not mentored (44.4%)	Y
McArthur[39]	Colorectal laparoscopy	NA	Perioperative outcomes	There was an increase in laparoscopic surgery, significant reduction in length of stay, a change in practice resulted in reduction in infection compared to pretraining	Y
Mussa[42]	Arterial switch operation	NA	Perioperative and long-term outcomes	"The mentorship process was associated with all surgeons achieving similar early and long-term survival, with no adverse effect on survival over time despite the appointment of new surgeons"	Y
Palter V[51]	Intracorporeal knot	Y	Video score OSATS, survey	"Comparing the pre- and postinterevention scores within both groups, there was an improvement in technical proficiency in the peer coaching group, yet none in the conventional training group"	NA
Rané[48]	Laparoscopic renal procedures	NA	Completion of the program and number of independent cases	6/9 coachees reached independent laparoscopic urological practice	NA
Rees[38]	Laparoscopic colorectal surgery	NA	Clinical outcomes and satisfaction	Consultants that already practiced laparoscopy felt they improved in safety and confidence. The program was rated higher than other CME, clinical outcomes included conversion rate at 1.5%, and 30-day mortality at 1.5%	Y
Sebajang[43]	Advanced laparoscopy	Y	Perioperatlve outcomes	No intraoperative complications, mortality	NA
Shalhav[44]	Laparoscopic urologic surgery	NA	Number of independent cases		Y

Author	Task Coached	Debriefing (Y/N)	Evaluation Used	Program Outcomes	Impact on Clinical Practice (Y/N)
Stefanidis[28]	Cholecystectomy, colectomy, hysterectomy laparoscopic or robotic	NA	NOTSS, OSATS, satisfaction	Coachee 1 performed 30 laparoscopic procedures and coachee 2 performed 10 laparoscopic procedures within a year of coaching "All surgeons appropriately accomplished some of the objectives of the distraction scenario, ...but no participating surgeon was able to achieve expert levels"	NA
Twijnstra[45]	Laparoscopic hysterectomy	Y	Perioperative outcomes, length of operation curve	"Both trainees performed LHs during their mentorship program comparable with the LHs performed by the mentor"	Y
Wenghofer[52]	Patient records	NA	Postassessment questionnaire, reassessment	"Most focus group participants indicated that they implemented recommendations made by the assessor and made changes to some aspect of their practice"	Y

OSATS: objective structured assessment of technical skill; OREEM:operating room educational environment measure; NOTSS: nontechnical skills for surgeons; Lapco TT Course: train the trainer, laparoscopic colorectal training course.

Barriers to Coaching

Barriers to participating in coaching were reported in 13/27 (48%) of studies. Of these, 1 was a qualitative study exploring surgeons' opinions regarding coaching and did not include a coaching implementation component.[32,53] Through qualitative analysis and data coding, 3 overarching subthemes for barriers to coaching emerged: *Logistical Constraints, Surgical Culture and Perceived Lack of Need.*

Reported *Logistical Constraints* to coaching participation included lack of time, low volume of cases at the coachee's base hospital, regulatory and credentialing challenges limiting the ability of participants to move between institutions where they do not normally work, limited supply of qualified coaches, remuneration concerns, geographical separation, and technical problems. One study reported difficulty videotaping cases and lack of support from hospital administrators.[49] Time constraints preventing coaches and coachees from meeting, or a direct negative impact on surgical practice due to increased operative times during coaching were also cited.[32,35] Overall, logistical constraints were reported in 10/13 (77%) of studies that reported barriers and included comments such as:

"[need] more time to practice"[50]

"giving up a day of your time is significant"[32]

"OR time is limited and precious" [32]

"... I spent some time trying to get things right, but ultimately, I just did not have enough time to be able to devote to this..."[16]

Surgical Cultural as a barrier to coaching participation was reported in 6/13 (46%) of studies that reported barriers to implementation. Being coached was associated with real or expected feelings of negative judgement by peers, students, patients or other health care workers, feelings of potential intimidation, generalized anxiousness, and fear of appearing incompetent. Further cultural barriers to coaching included fears of loss of autonomy or control, and power and competition among colleagues. One study observed existing positive relationships between coaches and coachees helped participants get past the initial discomfort of engaging in coaching.[32] Another study concluded the limited participation rate they achieved reflected the qualms surgeons have to receiving feedback.[28] Additional examples of comments coded into the theme of surgical culture as a barrier to coaching included:

"There would be a high risk of it having negative perceptions by people, so whether it's nurses, residents, fellows I think it would be perceived as either a sign of weakness or a sign of inability or a sign of lack of confidence because it's not the norm"[53]

"Surgeons tend to think that if we call somebody, they're gonna think we don't know what we're doing"[32]

"Maybe I should just stick with thing that other people aren't doing that I have expertise in..."[53]

"You are supposed to be the big dog expert and so I think it takes a lot of pride swallowing to the next day have a coach come in and critique you openly in front of people and then the

day after that you are back to being the only one in the room and you need everyone to take you just as seriously and with as much respect as they took you the day before" [53]

".. I find the person and then they coach me. Then I decide when I have had enough coaching"[53]

"we were taught to operate independently, and that culture still exists. You don't want someone looking over your shoulder"[32]

Lack of perceived need for coaching in comparison to other available CME activities or lack of need to learn new skills was cited in 2/13 (15%) of studies reporting barriers to coaching. One study stated the authors assumed a priori that all surgeons want to continuously improve their technical skills[53] however several participant comments suggest technical improvement is not necessarily a goal of all practicing surgeons. At least 1 study expressed participants thinking they were good enough at what they did and needed no further improvement since they did not believe improving their skill would result in improved patient outcomes.[53] Furthermore, at least 1 participant in 1 study reported being satisfied with existing CME activities and therefore saw no need for coaching to advance proficiency.[52] Example statements coded along the theme of perceived lack of need for coaching as a barrier to coaching participation include:

"The CME component did not seem appropriate in the peer assessment. The educational value was from me looking at my practice critically prior to the peer assessor's visit. I do CME activity elsewhere, and [it] is not needed here"[52]

"Is that really how I want to spend my time? …"[53]

"I think I'm very good at what I know… as you get older if you don't have the stimulation from surgery to get better or to do things that are different and you are so good at so much, why bother [with coaching]?"[53]

"…The quality of your technical skills is not a measure of which anyone gives sort of enough weight. So it's very easy to say I'm pretty good or I am good, my outcomes are fine, I've got bigger fish to fry"[53]

Discussion

This systematic review of the available literature summarizes the characteristics, outcomes, and participant feedback of coaching programs for skill refinement and acquisition among surgeons in practice. Of those who participated in a coaching program, positive opinions and outcomes were frequently reported including a high rate of implementation of skills learned into clinical practice. Concerns regarding logistical constraints, negative judgement by peers or professional consequences for being coached, and perceived lack of need emerged as barriers to coaching participation.

Classically, coaching is described as a learning interaction in which an expert observes another's performance and provides objective, formative feedback with an aim to encourage self-reflection of performance to accomplish predetermined goals.[10,54] Three distinct components comprise a coaching program: (1) setting goals, (2) encouraging and motivating and (3) developing and guiding. Peer coaching is a distinctive model in which 2 experts, at a similar level of knowledge, engage in a noncompetitive relationship to support learning.[5,8,9,14,55] The success of any coaching model relies on establishing a quality

relationship between participants. This most frequently requires establishing mutual trust, commonality, compatibility, and credibility,[10,11,56, 57, 58, 59]

Coaching for surgeons has been modeled after other high-performance activities such as sports, music, business, and even life coaching. The ubiquitousness of coaching in sports and other highly-competitive disciplines requiring refined proficiency is derived from the observation that few can become elite performers on their own.[60] Without focused practice guided by external feedback ("deliberate practice"[2]), skills in any discipline tend to plateau or even decay over time.[2] A coach can thus help identify performance gaps and guide 1 toward ever-heightened levels of skill.[14]

According to the American Board of Medical Specialties, practice-based learning and improvement (PBLI) is 1 of 6 core competencies that every practicing physician should demonstrate.[9] Participation in traditional CME activities, such as attending lectures and reading journals, have been the modalities through which practicing surgeons have acquired knowledge and skills for decades. Yet, several studies have demonstrated that these modalities often do not impact surgeon behavior, as most of them do not incorporate PBLI as a tool, and are not the ideal model for acquiring complex skills.[6,9,41,61] Theories of adult learning establish that motivation and intrinsic drive is what encourages an adult to pursue new learning opportunities. In this paradigm, motivation increases if the skills to be acquired are relevant to the learner's work and if the coaching is focused on achieving personal goals.[16] CME activities for practicing surgeons that are interactive and focused on PBLI are thus believed to be more likely to result in changes in surgeon skill and behavior.[6,7]

The strongly positive impact of coaching on surgical practice described by other authors[16] is reflected in the findings of this systematic review. Most participants in surgical coaching programs across all studies rated the experience highly, stating in most cases that coaching should be introduced as a CME tool and that surgeons would benefit from its use. Rates of knowledge retention and practice change reported from traditional learning modalities such as lecture attendance and journal reading have been reported to be close to cero.[6,62] This review found coaching interventions across all interventional studies published to date resulted in durable practice changes among 42% to 100% of surveyed participants, surpassing the rates reported for other commonly-employed CME activities in which learning tends to be more passive.[6,34,35,63]

This review identified that 1 barrier to coaching participation among surgeons is the culture of surgery itself. Surgeons who had not participated in a coaching program reported fearing their autonomy would be impeded through coaching or, that by accepting coaching, they would be negatively judged by their peers as being incompetent.[53] Despite this, these sentiments were not echoed by those who completed a coaching program. While this may be due to selection bias, whereby those open to coaching participated in available programs and those opposed did not, the outcomes of this review demonstrate participants rate coaching as an overwhelmingly positive experience with no reported negative implications on participants' autonomy or status among their peers. Prevalence of negative or positive views toward coaching among the broader surgical community could not be determined from this review, however. Since one of the core tenants of any coaching program is voluntary participation, negative perceptions among putative participants must

be addressed as this can be expected to greatly limit uptake and proliferation of coaching programs.

Logistical constraints were also cited as a major barrier to coaching implementation. Issues related to time, distance, remuneration, credentialing, and lack of knowledgeable coaches were reported by participants across studies as limitations of face-to-face coaching models. Methods to overcome these challenges, such as use of videoconferencing with telestration technology to overcome travel and regional credentialing constraints, recognition of coaching activities as remunerable by payers, and formalized training to increase the pool of high-quality coaches will be necessary if coaching is to be applied more broadly among surgeons in practice.

Finally, a perceived lack of need to receive coaching was repeatedly cited as a barrier to participation. None of the articles included in this review reported perception of need by years in practice, specialty, practice setting, or any other demographic subgroup. However, several participants' quotes give the impression these sentiments were expressed mainly by experienced surgeons who felt their skills had become solidified over time and therefore external feedback would be of little value to them. These perceptions likely reflect the historical lack of any structured, personalized feedback for surgeons in practice. A practitioner who has spent his and/or her career in isolation can understandably be less interested in external feedback than one for whom such a CME model was the accepted standard. Furthermore, as procedures are rarely standardized in surgery, the lack of reproducible benchmarks against which to measure one's own performance may contribute to a lack of interest in coaching. Surgical practice is evolving however, and

currently techniques and approaches to surgery are changing more rapidly than ever before.[64] CME offerings are increasingly focused on acquisition of new skills and techniques rather than purely skill maintenance or enhancement.[61] It thus remains to be seen whether interest in coaching will increase with time in practice for future surgical generations to adapt to the changing practice landscape.

Limitations of this study include the heterogeneity of coaching interventions, precluding pooled analysis or the ability to draw more than generalized conclusions. Studies varied considerably with respect to how coaches were selected, preintervention training and postintervention debriefing, the goals of the interventions, number of coach-coachee interactions, surgical subspecialties represented, and outcomes measured. Furthermore, many studies did not report the impact of the coaching intervention after completion and many did not investigate or report participant coaching needs or barriers to participation. Thus, while this review summarizes surgical coaching interventions to date, and several themes became apparent across interventions, considerably more work is needed to determine the educational needs of surgeons that coaching might address, the optimal method for implementation of coaching programs, and means to overcome barriers to the broad uptake of coaching for surgeons in practice outside of small, time-limited and research-based interventions. Future studies addressing these knowledge gaps are needed to truly determine the usefulness of coaching as a learning modality.

Conclusion

Coaching is highly rated by participants and rates of knowledge retention and changes in practice after coaching exceed those reported for traditional CME modalities. Coaching may thus provide an impactful mechanism for ongoing skill development for surgeons in practice in addition to existing CME activities required for regulated knowledge updates. Barriers to coaching implementation include logistical constraints, fears of judgement and loss of autonomy, and a perceived lack of need. Further research is needed to understand the needs and barriers to coaching for practicing surgeons if this learning modality is to become broadly accepted and implemented.

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CHAPTER III. IDENTIFYING OPINIONS, MOTIVATIONS, AND BARRIERS FOR PEER SURGICAL COACHING AMONG LOCAL SURGEONS

3.1 Preamble

The previous chapter provided an understanding of the current situation and the use of peer coaching in surgery. We identified a small number of coaching programs, mainly from North America. We found that surgical coaching as a continuing professional development modality is positively rated and has higher knowledge retention and practice change rate when compared to currently used CPD modalities, like lectures at conferences or reading peer-reviewed journals. However, we also identified several barriers that could hinder participation in these programs. While conducting the systematic review, we realized that all programs were structured differently and did not necessarily align with surgeons' needs. Therefore, with the objective of designing peer coaching programs that are useful, can solve the barriers to participation and increase the number of surgeons willing to engage, we sought to explore the understanding of, opinions to, motivations, and barriers to coaching of a representative local cohort of surgeons. To do this, we conducted five regional focus groups with practicing surgeons from different practice environments and years in practice. To guide the conversation, we developed open-ended questions from the data acquired from the systematic review and built a thematic framework to guide data analysis.

3.2 Manuscript 2: Identifying Optimal Program Structure, Motivations for and Barriers to Peer Coaching Participation for Surgeons in Practice – A Qualitative Synthesis

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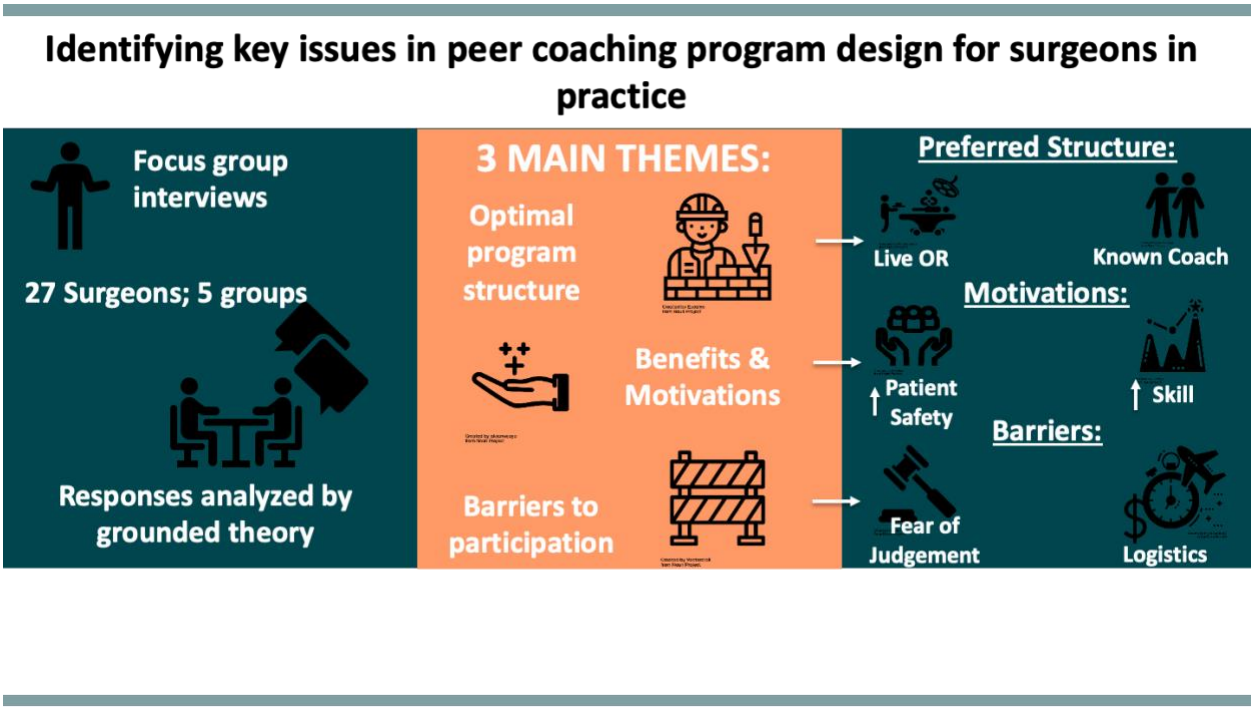

Fig. 3.1 Graphic Abstract

Abstract

Background. Continuous advancement of surgical skills is of utmost importance to surgeons in practice, but traditional learning activities without personalized feedback often do not translate into practice changes in the operating room. Peer coaching has been shown to lead to very high rates of practice changes and utilization of new skills. The purpose of this study was to explore the opinions of practicing surgeons regarding the characteristics of peer coaching programs, in order to better inform future peer coaching program design.

Methods. Using a convenience sample, practicing general surgeons were invited to participate in focus group interviews. Allocation into groups was according to years in practice. The interviews were conducted using open-ended questions by trained facilitators. Audio recordings were transcribed and coded into themes by two independent reviewers using a grounded theory approach.

Results. Of 52 invitations, 27 surgeons participated: 74% male; years in practice: < 5 years: 33%; 5–15 years: 26%; > 15 years: 41%. Three main themes emerged during coding: ideal program structure, motivations for participation, and barriers to implementation. For the ideal structure of a peer coaching program all groups agreed coaching programs should be voluntary, involve bidirectional learning, and provide CME credits. Live, in situ coaching was preferred. Motivations for coachingparticipation included: desire to learn new techniques (48%), remaining up to date with the evolution of surgical practice (30%) and improvement of patient outcomes (18%). Barriers to program implementation were categorized as: surgical culture(42%), perceived lack of need (26%), logistical constraints

(23%) and issues of coach–coachee dynamics (9%).

Conclusion. Peer coaching to refine or acquire new skills addresses many shortcomings of traditional, didactic learning modalities. This study revealed key aspects of optimal program structure, motivations and barriers to coaching which can be used to inform the design of successful peer coaching programs in the future.

Keywords: surgery, coaching, continuous professional development, education, training

Introduction

Residency and fellowship training rely heavily upon coaching and feedback by senior colleagues.[1] This training method is a cornerstone of "mastery learning" [2,3] in which iterative deliberate practice[4] with feedback results in achievement and maintenance of competence for both technical skills and knowledge. Increasingly, deliberate practice during residency is considered crucial to the successful acquisition of the technical and non-technical skills required to safely perform operations independently and to care for surgical patients. [5,6] However, once training ends, very little structured, longitudinal peer feedback exists to support the continuing professional development (CPD) of practicing surgeons or surgical care teams. [7]

Despite the relative lack of utilization of individualized peer-to-peer feedback in surgery, patient safety clearly improves when such discussions and learning take place. [8] Interventions which systematically facilitate interpersonal communication and knowledge sharing pertaining to real- world cases have repeatedly been shown to reduce medical errors in surgery. [9] Common examples include the surgical safety checklist, morbidity and mortality conferences and development of standardized care pathways, all of which facilitate structured, collective knowledge dissemination among colleagues, and have been directly linked to improved peer-to-peer collaboration and reductions in surgical complications.[8, 10–12]

In this vein, a number of "peer coaching" interventions in surgery, aimed at improving knowledge and skill retention, have been reported to date, with 85–100% of participants reporting sustained changes in practice as a result of being coached. [13] This

rate far exceeds the rate of adoption of new knowledge or skills reported by the most mainstream of CPD activities in medicine—conferences or lectures— which have been shown to have a negligible impact on the practice of physicians across numerous specialties. [14–16] Certain aspects of surgical care have already been identifiedas likely to benefit from a peer coaching model. Implementation of enhanced recovery after surgery (ERAS) protocols have been linked to improved patient outcomes for a large number of procedures, but resistance to implementation from front-line care providers is a major limitation to widespread ERAS dissemination. Peer mentoring during the implementation phase has been shown to overcome thisbarrier. [17]

The purpose of this study was to explore the opinions of practicing surgeons regarding the optimal structure and characteristics of peer coaching programs, as well as motivations for, and barriers to participation, in order to better inform future peer coaching program design.

Methods

Study design

Focus group interviews of 5–6 participants/group were conducted according to recommended guidelines for focus group conduct and reporting. A focus group design was selected over other methodologies such as survey or semi-structured one-on-one interviews as focus group allow for discussion among participants, leading to potentially richer insights into opinions and thoughts of the group members. [18, 19]

Open-ended questions for discussion were developed using an iterative process based on a previous systematic review conducted by our research group, 13 and through consultation with local content experts and a researcher with dedicated expertise in the performance of qualitative research. Using an inductive approach [20] three core question domains were identified: (a) structure and components of an ideal coaching program, (b) motivations for peer coaching for skill acquisition or refinement in comparison to existing CPD activities, and (c) perceived barriers to peer coaching implementation and participation.

Participant recruitment and sample size calculation

All practicing surgeons holding a license in the Province of Quebec (Canada) to practice general surgery, and its subspecialties according to the Royal College of Physicians and Surgeons of Canada, were eligible to participate. An invitation to participate was sent in French and English by email to a convenience sample [21] of surgeons from academic, university-affiliated and community hospitals across the greater Montreal area. Respondents were organized into five focus groups of 5–6 people to optimize discussion flow. [18] Groups were organized based on preferred language of discussion and according to years in practice, to minimize seniority or hierarchy issues influencing the discussions. [22, 23] (Fig. 3.2)

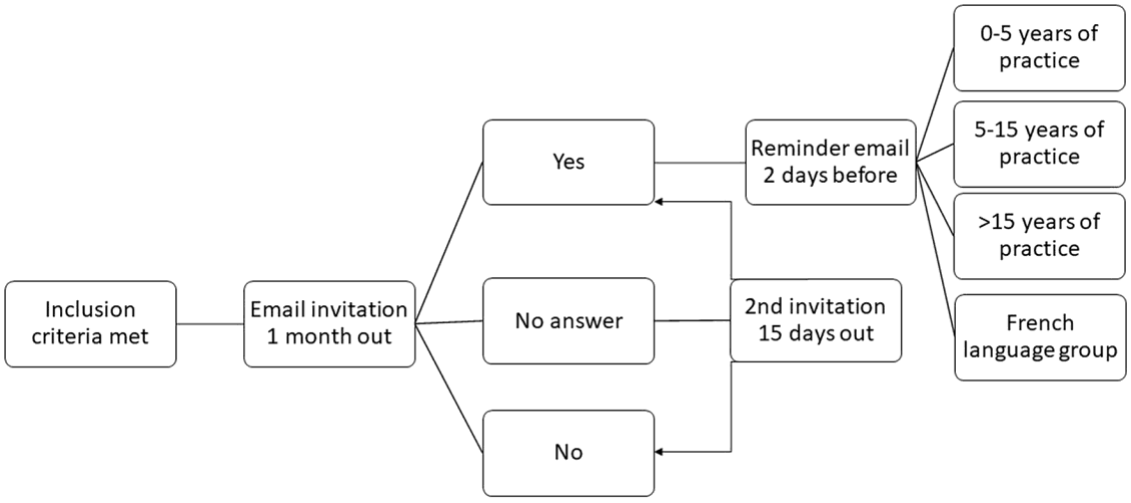

Fig. 3.2. Methodology flow chart. Methodology for the recruitment of participants

Focus group conduct and data collection

Two hours of time were allotted for each group discussion and all sessions were audio-recorded.

Volunteer facilitators were recruited through the Surgical Outcomes and Education Research laboratory at the Montreal General Hospital and from the Faculty of Medicine at McGill University. All facilitators underwent a structured 2-h training session with a researcher experienced in qualitative research and focus group conduct. Facilitators were pre-briefed regarding the research purpose, background, and goals for the focus group discussions. [22] One moderator and one note-taker were allocated to each group, and a standardized instruction sheet was provided. Each group was given the same open-ended questions and guidelines for discussion. Questions were developed in English and translated into French by a member of the research group familiar with the subject matter

and who self-identified as a native French speaker.

All participants signed a consent form and completed a baseline demographic questionnaire before beginning the group discussions. The discussion was started by exploring participants' own definitions and perceptions of coaching before the following standardized definition, developed through literature review by the research team, was read to the group: "A process whereby an experienced and trusted role model, advisor, or friend, guides another individual in the development or self-reflection of ideas, learning and professional development, working with mutual goals, and providing support for changes in practice."[13]

The open-ended questions were then posed, and the ensuing discussion led by the trained focus group leader for each group until all questions and topics had been addressed. After all focus group discussions were completed, a 1-h group debriefing session, led by the study coordinators, was held with all group facilitators present to summarize the main themes that emerged in each group. Facilitators then submitted a summary of the discussion from their own observations within 24 h of the focus group discussion.

Data analysis

Focus group discussion recordings and observer notes were transcribed verbatim by a professional medical stenographer bilingual in French and English. Data were analyzed according to constructivist grounded theory methodology [24] by two independent researchers (SV, KW) with the senior author (CM) serving as a tiebreaker in the case of disagreement. Focus group discussions and facilitator notes were coded into naturally

occurring themes, which were expanded as new themes emerged, and grouped using MAX-QDA software (VERBI GmbH, 2017, Berlin, Germany). The independent researchers met after coding every focus group to review the data coded and refine the emerging themes. Frequency of responses were quantified according to finalized themes.

Ethics and funding

The research protocol was approved by the Institutional Review Board of McGill University. This research is supported by a Royal College of Physicians and Surgeons of Canada Medical Education Research grant (2017-RC-MERG).

Results

Participant demographics

Of a total 52 invitations extended, 27 surgeons (20; 74% male) agreed to participate in the focus groups. Of these, 10 (33%) had been in practice < 5 years, 6 (26%) had between 5 and 15 years in practice, and 11 (41%) had been in practice > 15 years. The majority were fellowship-trained (n = 19; 70%) of which most (8;42%) were < 5 years in practice. Practice locations were evenly distributed between academic (n = 13; 48%) and community settings (n = 14; 51%). No participants had previously taken part in a formalized surgical coaching program or had experience with surgical coaching other than standard residency or fellowship training. Participant characteristics are presented in Table 3.1.

Table 3.1. Participant Characteristics

	N	%
Total participants	27	100
Male	20	74
Fellowship	19	70
Years in practice		
>15 years	11	41
0–5 years	10	37
5–15 years	6	22
Type of practice		
Community	14	52
Academic	13	48
Subspecialty		
General surgery	11	40
Colorectal	6	22
Surgical oncology	4	15
Bariatrics	2	7
Thoracic surgery	1	4
Urology	1	4
Vascular surgery	1	4
Endocrine surgery	1	4

Thematic analysis

During coding, a thematic framework was developed to guide categorization of the findings. Data emerged along three main themes: Optimal Program Structure; Perceived Benefits and Motivations for Coaching Participation; and Barriers to Coaching Participation. Responses pertaining to each major theme were further categorized by subthemes.The thematic map is presented in Fig. 3.3.

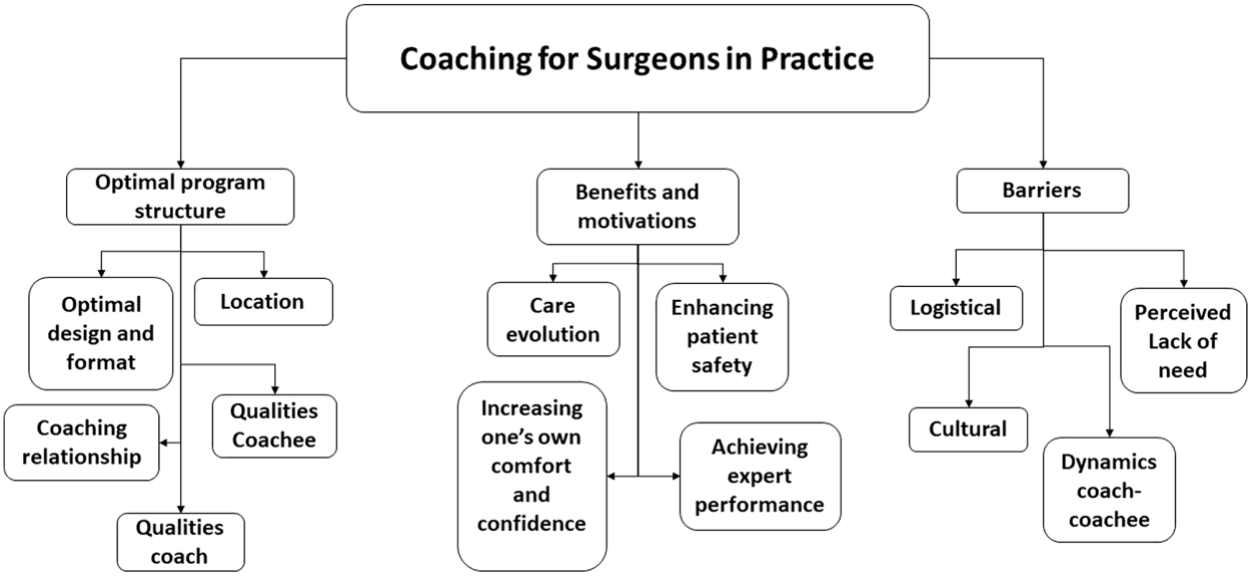

Fig. 3.3. Thematic framework. Themes with corresponding subthemes as they emerged and were coded from data analysis

Optimal program structure

After the concept of coaching was introduced and a definition agreed upon, focus group leaders began each session by prompting discussion regarding putative structural elements of a coaching program desired by focus group participants. These discussions prompted a total of 115 separate comments across all five groups, making Optimal Program Structure the second most discussed topic (after Barriers to Implementation) among participants (Fig. 3.4). Five subthemes of Optimal Program Structure emerged during response coding: optimal design and program format, location, qualities of coaches, qualities of coachees, and coaching relationship.

Optimal design and program format

Discussion regarding the optimal design and format of a peer coaching program prompted 86 separate quotations across all five focus groups. These centered around the following subthemes: types of interactions, participant autonomy, goals of coaching, and CPD credits.

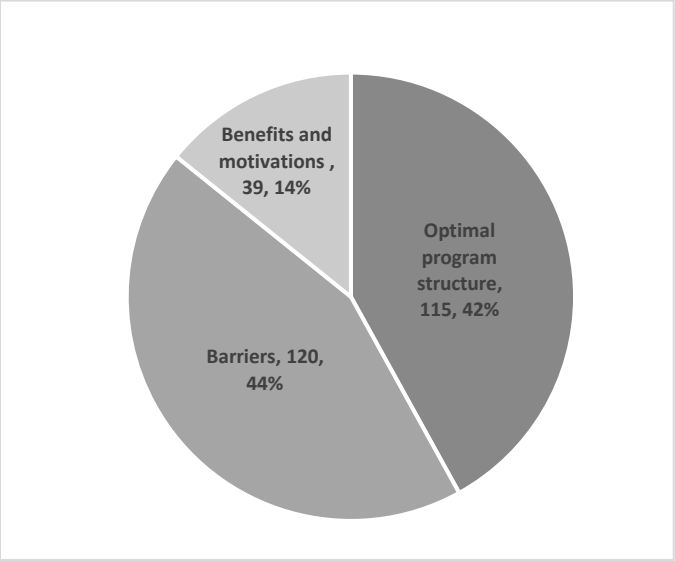

Fig. 3.4. Relative frequency pertaining to each major discussion theme. Number of times each discussion theme was encountered on data analysis

Types of Interactions were mentioned 22 separate times among all groups. Participants felt both unilateral and reciprocal models had merit depending on the needs and skills of the individuals involved and neither model was preferred; however, most agreed that coaching interactions should be reciprocal with both parties standing to learn from the other. Further, groups agreed on the need for interactions to be positive and engaging. Examples of quotations reflecting these issues include:

In most cases it actually goes both ways. It's a two- way coaching.

And then you just ask them to coach…it's like dynamic process, then the other day or the day after, you may coach for something else…

[it has to be a]…Positive experience

It has to be fun… it has to be an enjoyable experience otherwise you won't do it

… it should be interesting and exciting for every- one…

All groups agreed unanimously that participant autonomy in choosing to participate, selecting a coach and settingmeaningful personal goals were necessary for the successof a coaching program. A total of 12 quotations across all groups reflected these sentiments with no disagreements vocalized or noted by the trained observers. Free ability to withdraw from the coaching interaction was also raised as an important factor in establishing a safe coaching environment.

It's an adult relationship.

And you may realize along the coaching you don'twant them coaching.

…the coaching should come from them voluntarily. It's something you asked for, if it's not working out for you, you don't do it again.

Similarly, participants agreed the goals of coaching should be established by the participants, particularly the one receiving coaching:

I would like to select my cases and what I want to getout of it

The need for the program to provide credits for continuous professional development programs, like other learning activities, was also discussed. In this theme, coaching was compared to other CPD modalities and it was generally felt by all participants that coached learning activities should be recognized for CPD credit. Study subjects felt that participation in a peer coaching program would further their career development, expand their practice scope or skills, and help them stay up to date, so receiving credits for participation was justified and also an important component of program design.

Location

Most participants agreed the optimal location for coaching to take place was live in the operating room with only one participant, feeling post hoc video review to be a desirable coaching modality. This participant stated that using a post hoc video review could help bridge a barrier in geography, and would reduce fear of being judged by the coach or given negative feedback, but did agree with the other participants that live coaching, with real-time feedback and on-the-spot implementation of new techniques, would be preferred if possible. Comments from all five focus groups reflected the ubiquitous desire for a coach to be *"standing next to you or across the table"* during a live procedure. The potential use of simulation for coaching was not raised discussed by any group.

Qualities of a coach

Participants agreed coaches need to have skills or experience that are valued and respected by the coachee for feedback to be meaningful. All groups agreed coaches should have specific coaching skills and be trained and certified to become coaches. Technical proficiency alone was felt to be insufficient to be a successful coach. Particularly, participants agreed not everyone may be suitable to coach others. Characteristics other than technical knowledge that were felt to make effective coaches included: the ability to develop trust and rapport; having sensitivity to the needs and feelings of the person receiving coaching; and understanding one's own limitations. As one participant said, a good coach needs to *"be able to distinguish how far you can push certain people."* Another pointed out *"it requires humility on the part of the coach."* Respect for the coachee and experience were also deemed important characteristics of coaches: *"They would have to at least be able to view you as an equal..."; "I think you'd have to put in a certain amount of time before you could start offering your advice to others that's what I'd like."*

Qualities of a coachee

Optimal characteristics of coachees were discussed less frequently than those of the coaches, with only one group discussing this topic in depth. Within this group, participants agreed a coachee must be: willing to be coached; receptive to feedback; and honest about their skills and goals. Sample statements reflecting these thoughts included:

You need someone receptive.

And the person has to be willing to take the instruction...

…whoever's being coached has to be honest… Especially if you get something new and you've never done, like advanced laparoscopy, it takes a lot of humility

Coaching relationship

The coach–coachee relationship was discussed by all groups with nearly all participants (n = 25; 92%) feeling a coach should be someone the coachee already knows and trusts. Participants felt that, if the coach were known to them, they could quickly establish a more comfortable coach–coachee dynamic than if they were starting from scratch. All groups agreed the best learning experiences would happen when coaches and coachees already had a connection and felt at ease with one another. Participants generally agreed the coachee should have the option of choosing their coach, and felt the coach had to feel motivated to be partnered with their coachee to engender the most engaging and mutually enjoyable learning environment.

I think the best coaching relationship is with someone who [you] already have a good relationship with…so it can only get better in those circumstances.

…I think in order to be coached, you need to trust the person who's doing your coach[ing]. It can't be a stranger.

Only two participants expressed a desire that the coach be unknown to them. These surgeons expressed fear of being judged or disappointing their role models who already know them and hold expectations of their level of expertise, and thus preferred being coached by a stranger. The benefit of an outsider's perspective bringing novel ideas to the

learning environment was also expressed:

> *… I think I would want a coach that's as someone who's independent who is not my mentor because I would not want to disappoint my mentors, so I might be like extra good and like extra fantastic in the OR because you want to kind of…you have that like "I want to be…". You just want to prove that you are good.*

> *You need an outsider, somebody that doesn't know youthat thinks differently than you do just because you need a different mindset.*

Benefits and motivations for coaching participation

Reasons for pursuing peer coaching were discussed by eachgroup, with motivations for participation emerging along four main themes: care evolution, enhancing patient safety,increasing one's own comfort and confidence, and achievingexpert performance.

Care evolution

Within the topic of motivations for coaching, the rapid paceof care evolution in surgery was a major focus of discussion among all groups, with all participants agreeing that coaching would be superior to less interactive methods of continuous professional development (such as conference attendance or journal reading) for adopting new skills and approaches into one's own practice. Sample statements reflecting these sentiments included:

> *Surgery evolves… almost yearly … as it evolves, youhave to keep up*

A course is great but unless you keep doing it, it's notenough…so either a new fellowship or peer to peer coaching…you scrub with someone who does these allthe time and is willing to coach you, willing to show you, willing to let you go on your own.

Patient safety

Improving patient safety and care outcomes was the secondmost commonly cited motivator for pursuing peer coachingamong all participants. Coaching was perceived as a meansof improving individual, as well as team, performance;several participants stated coaching could improve patient safety if implemented for the entire surgical team rather thansolely the primary surgeon. One participant summarized themotivation for coaching participation as: *"[the] goal here isto improve the care of the patients…"*.

Comfort

An additional motivator for coaching participation was improving surgeon comfort and confidence. This was also discussed in the context of alleviating loneliness that might be experienced by surgeons who typically work in isolation. Within this category, patient outcomes were not the explicit goal of coaching participation but rather it was to make the primary surgeon feel subjectively more at ease with their own performance, decisions and techniques.

Comments within this theme highlighted the importance of shared experiences among colleagues with one participant explaining the benefits of having a coach as wanting

some-one *"to kind of hold my hand until we're safe."* Another participant explained the potential benefits of coaching in terms of comradery, saying: "*it makes me feel more comfortable if I know there's somebody there that can help me through what I'm going through."*

Proficiency and expertise

Finally, achieving increasing levels of proficiency and expertise for their own sake emerged as a separate motive to pursue coaching. Participants discussed surgical techniques for which workshops were difficult to access or non-existent. In this context, having an experienced peer provide longitudinal, personalized feedback was viewed as superior to attending a lecture or workshop in which the learning would be sporadic and the feedback more generic. Furthermore, personalized coaching was viewed as an opportunity to have an experienced surgeon observe one's progress over time and in the same environment where the learner actually practices, allowing for more accelerated and applied learning to take place. The peer coaching model was thus seen as a method to more rapidly achieve expert performance than could be achieved by more traditional learning modalities:

The fastest way to get to proficiency to where you don't need someone and help you and coach you is to have a certain number of proctor coached cases…

Because as the coachee, you want to become an expert in something and so you are not going to do quickly by yourself…

Barriers to coaching participation

This was the most discussed theme across all five focus groups with 120 comments tabulated overall. During thematic analysis, barriers were divided further into four sub-themes: surgical culture, logistical constraints, perceived lack of need, and coach–coachee dynamics.

Surgical culture

Barriers categorized as Surgical Culture occurred most frequently (35 quotes) and included fears related to being perceived as incompetent or being judged, potential intimidation, loss of control, and anxiety caused by being observed. Participants across all five focus groups expressed concern that negative feedback might be given in front of colleagues or coworkers and were fearful of how this would impact their reputation. Examples of comments related to Surgical Culture as a barrier to coaching participation included:

I mean you are putting yourself in a position where youare obviously going to be judged somehow.

You know, like what's wrong with him? Why does heneed it? Or like there must be a problem with her.

… so of course, it doesn't help your reputation and unfortunately, the hospital is kind of like a little villageand you know word goes around…

How am I to appear to others? You suddenly have a coach and nobody else does.

…it would crush me… would they think I failed? You get shamed.

Participants also expressed anxiety and stress related to being a coach and living up to others' expectations of one's expertise. Particularly, participants expressed feeling responsible for the outcomes of the case if they were advising asa coach. Further fears included worries about the quality ofcoaching given and living up to others' judgements of how a coach should perform. Quotes expressing these sentimentsincluded:

you are asked to help someone… if it doesn't go well,who does that reflect on?

what if you are not coaching well

Perceived lack of need

Perceived Lack of Need as a barrier to coaching participationwas the second most discussed subtheme with 32 separate quotes cataloged across all five groups. Comments centeredaround: not wanting to be coached, the feeling of not needingto be coached, and the existence of alternative CPD modalities obviating the need for coaching. Examples of responsescategorized as a Perceived Lack of Need included:

You get set in your ways

I don't need coaching with everything I do you know…Because I've been doing it for so long. I'm not coach-able.

I don't think any of us thinks of coaching for our- selves…

Going to conferences and to like a workshop [already].The problem is sometimes recognizing that you need it and you know… need someone to coach us

If you are doing pretty well. You're not going be like "Hey I need to go and try find and learn something new

Logistical constraints

Logistical Constraints as a barrier to coaching participation were discussed 34 times by all five groups. Even participants who were generally keen on peer coaching expressed concerns regarding the time commitment and other logistical barriers involved in implementing this learning modality. Cited logistical barriers included: lack of time/availability, remuneration concerns, confusion over patient ownership, lack of case volume, issues regarding licensure/privileges/insurance, and geographical separation of coaches/coachees. Examples of comments categorized as Logistical Constraints included:

Having two surgeons in the OR at the same time is a challenge.

…just the barriers that exist…. it's going and operating in another center…to get privileges…

It's remuneration [more] than cost. Somebody is not getting paid.

Time and distance.

And the problem is surgical. We need cases

Dynamics

Finally, Coach–Coachee Dynamics as a barrier to coaching participation came up 19 separate times and included: relationship issues, the impact of hierarchy, rapport and ego. Participants discussed the difficulties of a younger surgeon coaching a more senior colleague due to issues of hierarchy and pride. Younger surgeons recently graduated from fellow-ship expressed concerns that more established colleagues may not be receptive to learning new approaches, particularly from junior surgeons. Personality traits of coaches

andcoachees were also discussed, with most surgeons acknowledging the importance of good rapport and avoidance of ego conflicts between coaching participants for the learningactivity to be fruitful. Examples of such comments include:

I think you just have to be far enough along that peoplearen't going to be just offended with your presence.

I don't think most people want like a fresh graduate coming in and telling them how to do things... I wouldfeel very strange telling an experienced practitioner what to do, unless they were asking....

You need a rapport with the person you're coaching. You also have to somehow kind of gauge the ego ofthe person ... Or are you going to insult them by theway you approach them...and I know this is a surgicalproblem ...

Egos take away from the training and so they don't mesh with that person, you don't see eye to eye in theway that this happens, you're not going to learn from them and they're not going help you.

Discussion

This study utilized a focus group design to explore the opinions of practicing surgeons across a wide range of subspecialties, practice types and years of experience regarding the optimal design of, motivations for, and barriers to, peer coaching programs for skill acquisition and refinement. This work uniquely explored the thoughts and perceptions of potential "end users" of peer coaching programs, and the results of the qualitative analysis revealed important sub- themes within each of these core domains that

can be used toinform the design and implementation of successful coaching programs in the future.

Peer coaching has emerged as a highly effective modality for effecting practice changes among surgeons after formaltraining has ended, far exceeding that of traditional learningmodalities that are often passive (e.g., conference attendance) and/or short-term (e.g., weekend courses). [25, 26] A recent study showed that bidirectional feedback through peer coaching, framed around participants' individual goals,affords more opportunities for professional development than usual CPD activities. [27] Elements of peer coaching that seem particularly conducive to engendering long-term practice changes include individualized goal setting, personalized feedback (ideally in real-time), and longitudinal interactions allowing for skill refinement and retention overtime. [28] This is in contrast to many traditional CPD activities which are often sporadic, didactic and lack individualized feedback. [29]

Despite the demonstrated success of peer coaching interventions in the research context, this modality remains underutilized as a learning strategy for surgeons in practice. Most commonly utilized CPD activities are still didactic in nature, such as attending lectures and conferences, reading journal articles or performing pre-planned workshops underthe direction of an expert, where the curriculum is often set without participant input. Peer coaching, with its emphasis on mutual goal setting, longitudinal real-time feedback anda learner-centric approach, addresses many of the shortcomings of traditional CPD activities in surgery. Nevertheless, the results of this study highlighted several important barriers to coaching participation that must be overcome for peer

coaching to become more commonplace. Specifically, there was high agreement that being coached could expose the participant to judgment by their peers or harm their reputation. Unless surgical culture changes sufficiently that seeking routine external feedback on one's operative performance is normalized, widespread coaching participation is unlikely to occur. Further, due to the labor-intensive nature of coaching, significant logistical constraints such as time commitment, scheduling conflicts, geographical separation of coaches and coachees, licensure and privileging issues between institutions, and remuneration considerations would need to be addressed for peer coaching utilization to be ubiquitously applied. Another barrier to participation identified by this study was a perceived lack of need or willingness to be coached because of a feeling that one's performance is already "satisfactory". This highlights a gap between the aspiration for surgeons to be lifelong learners and the realities of becoming comfortable in one's own routine over time. [30] While coaching has proven superior to traditional, passive CPD modalities in terms of effecting real and lasting practice changes, this modality is unlikely to become more commonplace unless the barriers identified by this study are addressed and overcome.

While previous studies have suggested surgeons might be amenable to anonymous peer coaching, [31, 32] through video reviews for example, the results of our study contradict this. Greater than 90% of focus group participants felt they would only be open to feedback given by a known and trusted coach, ideally someone chosen by the coachee. Participants across all 5 focus groups expressed their desire to know who would be advising them in order to be open to receiving and acting on feedback regarding their

performance. This is in line with studies from disciplines outside surgery that have shown effective coaching programs must involve establishing rapport and cultivating mutual trust.[33–35] Although no participants had previously participated in a formalized coaching program, some statements likely reflect previous knowledge on coaching rather than a personal experience with true coaching. Participants agreed that the characteristics of a good coach should not be limited to technical proficiency but should also include having the ability to develop trust and rapport, being sensitive to the needs and feelings of the person receiving coaching and understanding one's own limitations, among others. As not all surgeons fulfill these requirements, a lack of suitable coaches is a barrier that must be overcome if coaching is to be more widely implemented. Measures that might increase the pool of suitable coaches might include the development of dedicated training programs, such as those provided by the Academy for Surgical Coaching, [36] to disseminate the skills needed to provide good coaching. [37, 38]

Fear of negative consequences as a result of submitting to peer coaching was raised by every group in this study. No peer coaching study in surgery to date has demonstrated direct negative consequences for participants; however, fear among surgeons of potential judgment by peers, loss of autonomy, loss of privileges and decreased confidence, among other potential negative effects, have been cited by others as barriers to coaching participation. [13] Poor coaching in domains such as executive coaching has been shown to lead to negative effects in coachees in areas such as psychological health, social integration, performance, motivation and competence;[39] however, no direct negative effects simply due to receiving coaching are commonly reported. In surgery, as in other domains, it is clearly

important that coaches establish rapport and cultivate mutual trust, and that coaching programs be implemented with the goal of continuous professional development rather than remediation or punishment.

Our participants generally felt live coaching in the operating room would be superior to video-based reviews done after the fact. Live coaching has several advantages over case reviews done at a later time, including allowing the coach to view and comment on non-technical skills that are important for successfully directing the conduct of a procedure, such as: situational awareness, planning, resource utilization, communication skills, and personal resourcefulness. [40] Moreover, live coaching allows the coachee to immediately implement the feedback received, allowing for enhanced opportunities to practice and greater long-term skill retention. Finally, by coaching directly in the operating room, the coach may be able to model a skill or behavior rather than just describing it, allowing for improved skill transfer to the coachee. [41, 42] Live coaching is time consuming and prone to logistical constraints, however, so may not be a viable option for all coach–coachee pairs. Furthermore, live coaching would not allow as much time for self-reflection as coaching done outside of the operating room. This issue could be addressed by incorporating planned time for self- reflection after the live coaching interaction, as well as planning multiple sequential sessions with the same coach to allow for self-reflection between sessions. Simulation may also provide a reasonable alternative to live coaching when suitable models exist; however, a lack of suitably complex and realistic models may be a limitation to simulation as a viable learning modality for practicing surgeons, explaining perhaps why simulation was not discussed by any group in this study.

Additional coaching program characteristics that participants felt would be important to encourage their participation and openness to coaching included: autonomy to define one's own goals, a reciprocal peer coaching structure allowing for bidirectional learning, and assurance they would not be open to penalties for submitting to coaching (e.g., participation would be free from the risk of withdrawal of privileges). When asked to compare coaching to other CPD modalities, participants of this study felt "coaching would have a huge role," and all groups agreed incorporating coaching into existing CPD credit schemes for maintenance of licensure would be welcome. These findings mirror results of others who have reported similar sentiments among surgeons regarding peer coaching.[13]

Limitations of this study include the inherent constraints of focus groups, such as the potential existence of power dynamics within a group that could limit an individual from disagreeing with the group consensus or fully sharing their personal preferences. Although our study design aimed to reduce the likelihood of this by grouping surgeons by years in practice and engendering a safe and power-free environment for conversation, most surgeons in this study knew of each other or had even worked with other participants at one point in time, which could have impacted free expression of each participant's views.[43] In addition, while participants were recruited from a broad range of practice locations and specialties, out of logistical necessity, they all hailed from one urban region which could limit the generalizability of these results. Nevertheless, the discussion covered a broad range of topics previously identified as important considera tions for coaching program design and consensus was largely achieved on most issues. Surgical culture and practice may vary from region to region, and so the results of this study may not be

generalizable to different geographic locations with alternative training or practice dynamics. The majority of participants in this study completed some portion of their training and/or had worked in other locations previously within North America, and several themes regarding barriers to participation have been cited by others, [13] so we do not expect the results of this work to differ drastically from opinions of other North American surgeons. To further explore regional variations in opinions regarding peer coaching in surgery, our group has developed a survey which is being disseminated to surgeons internationally.

Conclusion

Peer coaching as a means to refine or acquire new skills is viewed positively by surgeons in practice and addresses many shortcomings of traditional, didactic learning modalities. This study revealed key aspects of optimal program structure, motivations for, and barriers to, coaching participation, which can be used to inform the design of successful peer coaching programs in the future.

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Compliance with ethical standards

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CHAPTER IV. PEER SURGICAL COACHING WORLDWIDE

4.1 Preamble

In the last two chapters, we have described how surgical coaching is viewed among surgeons in practice, and their needs, motivations, and barriers to participation. We found what appears to be a higher rate of knowledge retention rate and practice change compared to other CPD modalities. By now, we have gathered that surgeons are open to participating in a coaching program. However, surgical culture, logistical constraints, relationship dynamics, and a perceived lack of need may hinder this participation. We also understand that to solve these barriers, a coaching program must be designed as a reciprocal program that eliminates hierarchy and power dynamics, gives the surgeon confidence and autonomy, and demonstrates better outcomes than other CPD modalities. However, most of the research, including our own, has been conducted with small cohorts of North American surgeons, prompting us to question if international differences in training, culture, needs, or governmental requirements could alter surgeons' opinions and desires to surgical coaching.

Using the thematic framework and definition we developed for the first two manuscripts and the data acquired from the focus groups, we created a survey designed to provide us with information about surgeons worldwide. The questions were constructed to gather information on currently used CPD modalities, certification requirements, and the understanding, needs, barriers, and receptivity to coaching.

4.2 Manuscript 3: Considerations for Designing and Implementing a Surgical Peer Coaching Program: an International Survey

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Fig. 4.1 Graphic Abstract

Abstract

Background. The need for ongoing skills development is well recognized in surgery, but common learning opportunities infrequently translate into real practice changes due to a lack personalized feedback. Peer coaching has been associated with higher rates of practice changes than traditional learning modalities, but uptake among surgeons is low. The purpose of this study was to survey surgeons internationally to investigate attitudes regarding peer coaching and to identify any international differences to better inform the design of future coaching programs.

Methods. A survey was developed using an iterative process based on previously published data. Practicing surgeons in general surgery or related subspecialties were eligible to participate. Invitations to complete the survey were distributed through 13 surgical associations, as well as social media and personal email invitations; recruitment was expanded using a snowballing method. Responses were obtained between June 1st - August 31st, 2020.

Results. A total of 521 surveys were collected. The majority of participants practiced in North America (263;50%) with remaining respondents from: Asia (81;16%), Europe (34;7%), South America (21;4%), Africa (17;3%), and Oceania (6;1%). Duration of practice was equally distributed across 4 intervals (0-5yrs; 6-15yrs; 16-25yrs; >25yrs). Respondents most frequently identified as general surgeons (290;67%), and 325 (75%) were male. Awareness of peer coaching was reported by 275(53%) respondents, yet 197(44%) never seek formal feedback from peers. The majority of respondents (372;84%) would be willing to participate in a peer coaching program as either coachee or coach, with monthly

interactions the most desirable frequency reported (193;51%). Coaching in the operating room was preferred by most participants (360;86%) over remote or delayed interventions. Few respondents (67;14%) would accept coaching from someone unknown to them. Participants identified key coaching program elements as: feedback kept private and confidential (267;63%); opportunity to provide feedback to the coach (247,59%); personalized goal setting (24458%); and the option to choose one's own coach (205;49%). The most commonly cited potential barrier to participation was logistical constraints (334;79%) while the fear of appearing unskilled or underqualified was cited by a minority of participants (46, 10%).

Conclusion. This international survey of practicing surgeons demonstrated that peer feedback is rarely used in practice, but there is high interest and acceptance of the peer coaching model for continuous professional development. Findings regarding preferred program structure may be useful to inform the design of future peer coaching programs.

Keywords: surgical coaching, continuous professional development, peer feedback, international survey

Introduction

The need for ongoing skills development is well recognized in surgery. During training, surgical residents benefit from senior surgeons' teaching and feedback to achieve proficiency and gain competence.[1-3] Once training has ended, however, surgeons are responsible for maintaining and advancing their skills independently with few opportunities for formalized feedback from experienced peers.

Recently, peer coaching has gained popularity as a novel continuing professional development (CPD) modality that allows for individualized feedback for surgeons in practice. Peer coaching establishes a coach-coachee partnership structured around analysis, self-reflection, and feedback to improve performance[4]. Recent studies have shown surgical coaching is feasible and positively perceived.[5-7] Furthermore, peer coaching seems to translate into a rate of real practice change of 85-100%,[7] substantially higher than that achieved by traditional, more passive, CPD activities such as lectures and reading the literature.[8,9] These results have led to enthusiasm for greater peer coaching utilization for CPD among surgeons in practice.[6,10]

Despite these positive findings, peer coaching remains mostly confined to the research arena. Small North American studies have identified potential barriers to peer coaching utilization that include fear of judgment and loss of autonomy, lack of time, logistical constraints, remuneration concerns, and a perceived lack of need for this modality compared to traditional CPD activities.[7,11] Successful planning and implementation of peer coaching programs will require a better understanding of the

baseline receptivity to, awareness of, and perceived needs for peer coaching among surgeons globally.

Therefore, the purpose of this study was to survey surgeons internationally to investigate attitudes regarding peer coaching and to identify any international differences to better inform the design of future coaching programs.

Methods

Survey design

An online survey was created according to recommended guidelines[12] using a secure platform capable of capturing anonymous responses (Survey Monkey Inc, Palo Alto, CA) and results tabulated according to the Checklist for Reporting Results of Internet E-Surveys.[13]

Questions were developed using an iterative process based on a framework for coaching program implementation developed from previous studies by our group.[7,11] Survey questions were organized around the following three themes: (a) optimal program structure, (b) benefits and motivations, and (c) potential barriers to coaching participation. Questions were reviewed by three surgeons from the research team (Appendix 3) and then translated into Spanish by a native speaker, and reviewed for clarity by a second native speaker. Baseline demographic information about participants was also collected.

Participant recruitment

Responses were collected between June 1 – August 31, 2020. All surgeons in specialties recognized by the American Board of Surgeons were eligible for study enrollment. Invitations to participate were sent by email or social media by 14 international surgical societies and disseminated through the personal contacts of all the study authors. The survey link was also posted to surgical groups on Facebook and Twitter. Respondents were then asked to disseminate the survey among their colleagues in a snowballing recruitment strategy. Participation was entirely voluntary, and responses were collected anonymously.

Definitions

To ensure a homogenous understanding of terms, we included two definitions within the questionnaire:

Coaching was defined as "a process whereby an experienced and trusted role model, advisor, or friend guides another individual in the development, or self-reflection of ideas, learning, and professional development, working with mutual goals, and providing support for changes in practice."[7]

Formal feedback was defined as “structured, planned feedback according to predefined goals.” [14]

Data collection

This survey was conducted via SurveyMonkey, a web-based survey platform which stores data securely in compliance with HIPAA (health insurance portability and accountability act) regulations. All data were collected anonymously. Participants received a survey link by e-mail or social media and completed the survey without IP (internet protocol) tracking, which was automatically sent to the SurveyMonkey database when finalized. Participants were informed about the study's purpose, provided with the contact to the primary investigator, and notified that the survey was strictly confidential and anonymous and consent for participation was implied with participation.

Data analysis

Data were downloaded from SurveyMonkey for statistical analysis. Results were grouped according to practice location by continent and years in practice. Descriptive statistics were used to report survey answers. All responses were included in the analysis. Results are reported as number (percent) unless otherwise specified. Percentages are based on the number of responses to each question; thus, the denominator is not always the same.

Ethics and funding

The research protocol was approved by the Institutional Review Board at McGill University. The study is supported by a Royal College of Physicians and Surgeons of Canada Medical Education Research grant (2017-RC-MERG).

Results

Participant Demographics

A total of 521 responses from 39 countries were collected, with 422 (81%) surveys completed entirely. Response rate could not be calculated as the exact number of surgeons who received the link could not be counted. Half of the participants were from North America (260, 50%), with the second-highest representation from Asia (81, 16%). (Figure 4.2). The most common practice setting was a university-affiliated hospital (135: 32%). Most respondents were male (324; 75%) and a majority (290, 67%) listed general surgery as their specialty designation. Participant characteristics are presented in Table 4.1.

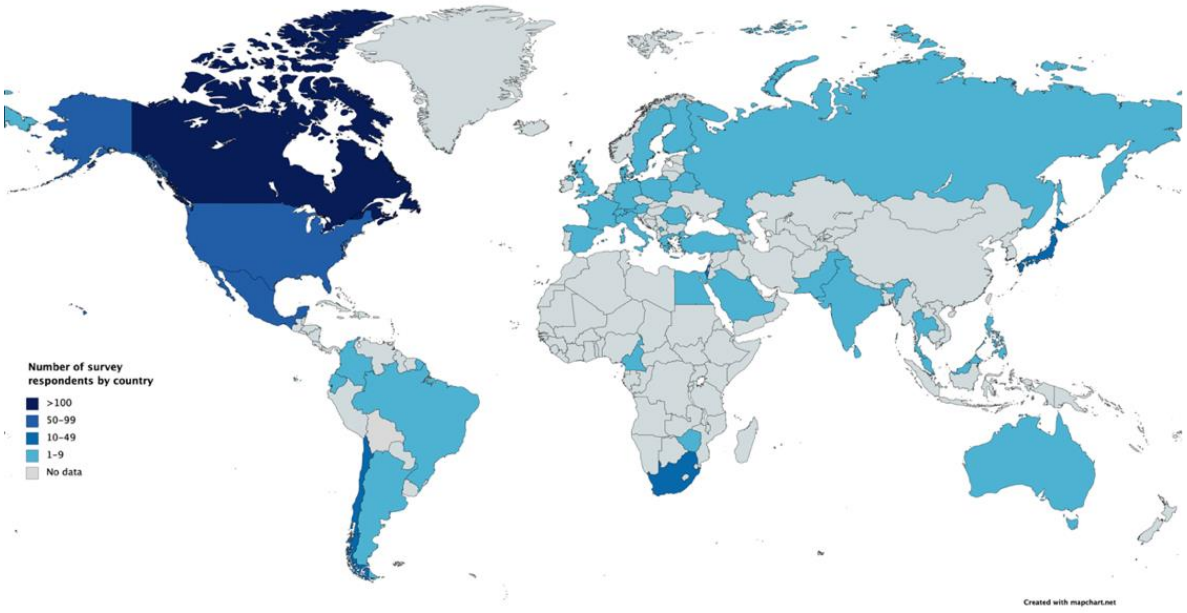

Fig. 4.2. Number of survey responses by country

Table 4.1. Participant characteristics. (99 respondents did not provide demographic data).

Characteristic	Number (%)
Years in practice	
0-5	107 (25%)
6-15	106 (25%)
16-25	98 (23%)
>25	111 (27%)
Sex	
Female	96 (22%)
Male	324 (75%)
Not disclosed	10 (2%)
Continent	
North America	263 (50%)
Asia	81 (16%)
Europe	34 (7%)
South America	21 (4%)
Africa	17 (3%)
Oceania	6 (1%)
Practice Type	
Community Private	89 (21%)
Community Public	46 (11%)
University affiliated	179 (42%)
Academic full time	95 (23%)
Sabbatical/Retired	9 (2%)

Table 4.1 (continued)

Military	5 (1%)
Specialty	
General surgery	290 (67%)
Colorectal Surgery	19 (4%)
Surgical Oncology	15 (3%)
Cardio-thoracic Surgery	14 (3%)
Vascular Surgery	12 (3%)
Bariatric Surgery	3 (1%)
Pediatric Surgery	9 (2%)
Trauma	2 (0.5%)
Minimally Invasive Surgery	2 (0.5%)
Plastic Surgery	19 (4%)
Otolaryngology	10 (2%)
Orthopedics	11 (3%)
Neurosurgery	7 (2%)
Obstetrics and Gynecology	7 (2%)
Urology	6 (1%)
Ophthalmology	4 (1%)
Fellowship training	
Yes	300 (70%)
No	130 (32%)

Just over half of participants had heard of surgical coaching before participating in this survey (275, 53%; North America 161, 61%; Asia 34, 42%; South America 11, 52%; Europe 17,50%; Africa 8, 47%; Oceania 4,66%, NA 40, 8%), with an equal distribution amongst years in practice. A large majority expressed interest in participating in a coaching program

(372, 84%; North America 217, 83%; Asia 69, 85%; South America 19, 90%; Europe 29, 85%; Africa 17, 100%; Oceania 5, 83%) and providing coaching (358, 84%; North America 220, 84%; Asia 68, 84%; South America 19, 90%; Europe 26, 76%; Africa 16, 94%; Oceania 5, 83%) as part of a formalized program. Only 15 respondents (3%; North America 10, 67%; Asia 3, 20%; South America 1,7%; NA 1, 7%) reported having no interest in participating in a coaching program.

Current Continuous Professional Development Strategies

The most common CPD modalities currently employed by participants were: attending hands-on courses (321, 62%), attending conferences (286, 55%), reading journals (246, 48%), watching edited videos posted by others (203, 39%), reviewing their own outcomes (191, 37%), and observing colleagues in the OR at the same institution (169, 32%). CPD use by modality and frequency are reported in Table 4.2. Most participants never review their own videos with a colleague (363, 70%), and just over half never do so independently (273, 52%). A minority of surgeons never attend hands-on courses (125, 24%), review surgical outcomes (56, 11%), or observe colleagues in the operating room (OR) at other hospitals (50, 10%).

Table 4.2. CPD use by modality and frequency n(%)

CPD modality	Daily	Weekly	Monthly	Annually	Never
Reading peer-reviewed journals	93 (18%)	246 (47%)	157 (30%)	17 (3%)	4 (1%)
Watching edited videos posted by other surgeons	42 (8%)	151 (29%)	203 (39%)	78 (15%)	43 (8%)
Attending meetings/conferences	22 (4%)	108 (21%)	97 (19%)	286 (55%)	4 (1%)
Participating in hands-on technical skills courses	9 (2%)	13 (2%)	46 (9%)	321 (62%)	125 (24%)
Participating in morbidity and mortality conferences in my own institution	0	0	3 (1%)	0	0
Reviewing my surgical outcomes	69 (13%)	92 (18%)	191 (37%)	113 (22%)	56 (11%)
Reviewing my own videos independently	15 (3%)	58 (11%)	99 (19%)	73 (14%)	273 (52%)
Reviewing my own videos with a knowledgeable colleague	7 (1%)	19 (4%)	61 (12%)	68 (13%)	363 (70%)
Observing or assisting other surgeons in the OR	92 (18%)	169 (32%)	136 (26%)	74 (14%)	50 (10%)
Observing or assisting other surgeons in the OR outside my institution	0	1 (0.2%)	1 (0.2%)	0	1 0.2%)

With respect to operating jointly with another surgeon, this most frequently occurred among survey respondents for only complex cases (222, 46%; North America 97, 37%; Asia 49,61%; South America 12, 57%; Europe 19, 56%; Africa 10, 59%; Oceania 3, 50%), with 19 (4%; North America 13, 5%; Asia 2, 2%; Europe 1, 3%) responding that they never operate with a colleague; 93 respondents (20%; North America 64, 24%; Asia 12, 15%; South America 5, 24%; Europe 5, 15%) reported operating with a colleague in all cases. When co-surgery cases did occur, less than a third (82, 28%) of participants reported providing unstructured or unsolicited feedback to colleagues "most of the time" while the majority

provided feedback “ocassionally” or “every time” (84, 28%; 78, 27%) (Figure 4.3)

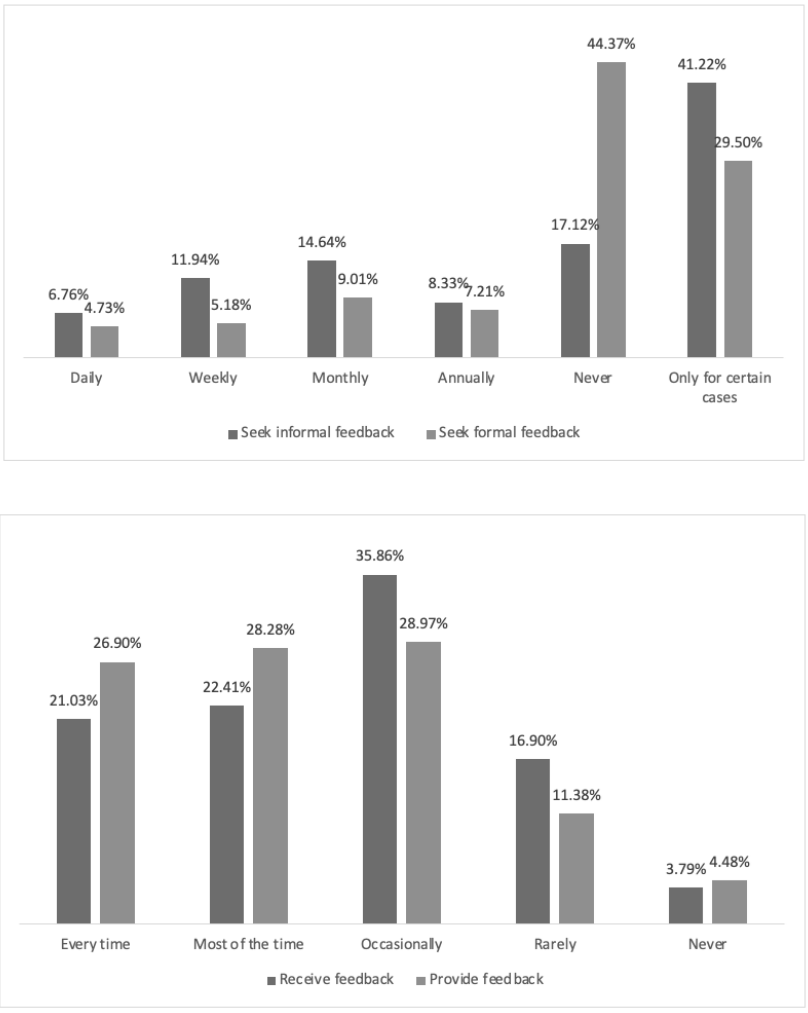

Fig. 4.3. Frequency and type of peer feedback currently sought and received by study respondants.

One hundred fifty-nine (31%, North America 81, 31%; Asia 24, 30%; South America 4, 19%; Europe 9, 26%; Africa 6, 35%; Oceania 2, 33%) respondents reported being required to submit to formalized assessments by local licensing authorities. The most common time frame for undergoing these assessments was between 1-5 years in practice (53, 37%).

Formalized assessments are required most frequently by the hospital (122, 82%), a professional licensing board (96, 65%), and the government (28, 19%), this most commonly takes the form of a continuous professional development credit system (91, 61%), maintaining certification in specific programs (89, 60%) and structured hospital performance reviews (61, 41%).

When asked how they view peer coaching in comparison to existing CPD modalities, the majority believed peer coaching to be more expensive (237, 56%), and less convenient (210, 50%) but also more fun (330, 78%), more patient-centered (297, 70%), and more practical (373, 88%) (Figure 4.4)

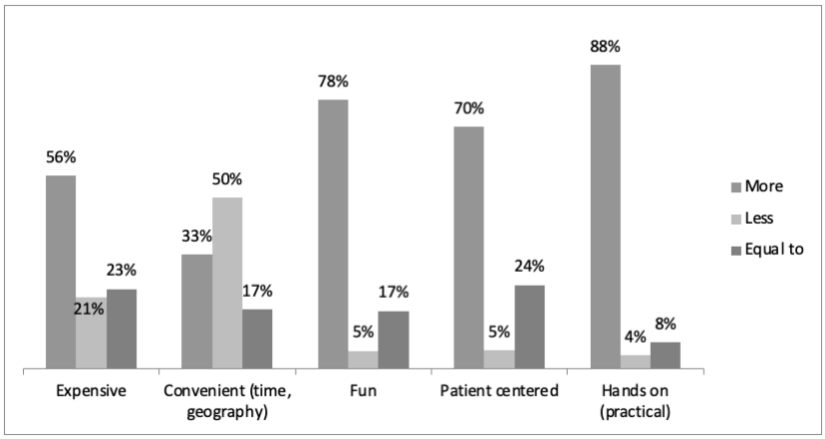

Fig. 4.4. Participants perception to coaching compared to other CPD modalities

Preferred Program Structure

Questions regarding participants' preferences around peer coaching program structure were organized according to program format, location, and coaching relationship.

Program format

Elements that were selected by over half of respondents regarding the design and timing of a peer coaching program included: having personal meetings with the coach to discuss their goals (285, 68%), receiving formalized feedback for personal use (267, 63%), having the ability to provide feedback to the coach (247, 59%), being allowed to set your own goals (244, 58%) and being able to change coaches if conflicts arise (235, 56%). Somewhat less commonly endorsed items included: being allowed to choose one's coach (205, 49%), receiving CME credits (2017, 49%), allowing the coach to define some of the goals (192, 46%), and being allowed to set the frequency and length of the interactions (170, 40%). Elements felt to be less important for participants included: receiving formalized evaluation for promotions (106, 25%), having the frequency and length of interactions predefined (115, 27%), receiving formalized feedback for review by the department chair (73, 17%), being able to decline assignation of a coach (1, 0.5%), having the coach scrub in to assist with procedures (1, 0.5%), to be able to set expectations for each session (1, 0.5%), and to have it be private and not seem like a penalty (1, 0.5%).

Concerning the number and frequency of interactions, most participants agreed the number of total interactions should be planned according to the learning goals (232, 55%), with ad hoc scheduling depending on needs and progress being the most frequently selected option (167, 40%). Very few respondents felt a single interaction would be sufficient (22, 5%). In terms of frequency, the most popular interval chosen was monthly interactions (193, 51%). (Table 4.3)

Location

The most popular venue for coaching among respondents was live in the OR (360, 86%), followed by *post hoc* review of pre-recorded videos (263, 62%) and simulator-based coaching (143, 34%). (Table 4.3).

Coaching Relationship

Regarding the coach's identity, only 67 (14%) respondents said they would be willing to be coached by a stranger. The majority preferred to be coached by someone they already knew or knew of (381, 86%), and most felt having some knowledge of the coach's skills and expertise would be essential (353, 80%). A small number would prefer to be coached by a friend (96, 22%) or a mentor 131 (30%). Relative age of the coach was not overly important to the majority of respondents, with 301 (68%) selecting "neither agree nor disagree" to the statement "If someone were going to give me feedback in the OR, I would prefer they be a younger surgeon with new skills" " and 243 (55%) for "If someone were going to give me feedback in the OR, I would prefer to they be one of my mentors/teachers (older than me)."

Table 4.3. Number of responses to questions about location, timing and number of interactions.

Program Element	Responses n(%)
Location of Interaction	
OR live	360 (86%)
Recorded videos	263 (62%)
Simulation	143 (34%)
Others	14 (3%)
Timing of Interactions	
Monthly	193 (51%)
Annually	75 (20%)
Weekly	86 (23%)
One time only	11 (3%)
Daily	6 (2%)
Number of Interactions	
Pre-established	232 (55%)
Ad hoc	167 (40%)
One time	22 (5%)

Benefits and Motivations for Coaching Participation

Most participants expressed interest in participating in coaching to improve patient care, including learning new techniques (362, 86%) and refining existing ones (345, 82%). Improving surgical outcomes and patient safety were also common motivators for participation (337, 80%; 318, 75%, respectively), followed by increasing one's confidence (248, 59%), networking with other surgeons (251, 59%), and for personal enjoyment (246, 58%). Less popular motivators included: to achieve expert performance (123, 39%), to receive CME credits (163, 39%), and to travel (152, 39%). Receiving remuneration was not a motivator for coaching participation among most survey respondents (80, 19%).

Barriers to coaching participation

The most common potential barriers to peer coaching participation revolved around logistical constraints such as: scheduling conflicts (304, 68%), remuneration issues (104, 23%), lack of expertise in their institution (81, 18%), low case numbers in their institution (78, 18%), geographic distance (77, 17%), and credentialing problems (59, 13%).

Barriers relating to surgical culture and acceptance of coaching were cited. These included: competition issues amongst colleagues (59, 13%), the risk of appearing unskilled or underqualified (46, 10%), the risk of receiving unpleasant feedback (25, 6%), and fear of losing control over the OR (23, 5%). Similarly, issues relating to perceived lack of need were infrequently viewed as barriers. Few participants felt they had enough learning opportunities elsewhere (34, 8%), already learn from the residents or fellows (14, 3%), or do not require any feedback (9, 2%).

In response to open-ended questions regarding barriers to coaching participation, taking opportunities away from residents was mentioned on three occasions (1%), “ego” was cited twice (0.5%), and one participant stated, "if I felt he could do it better, I would refer the patient to him."

Geographical variations

Variablity in the number of responses between geographical locations precluded statistical comparisons. However, there were no obvious differences in program design preferences between respondents from North America and the rest of the world. All participants prefer live OR coaching, however, there is a slight difference in preference for

the use of video coaching outside of North America. Additionally, all participants prefer having a set number of scheduled sessions, but North American participants also advocate for adhoc sessions. Finally, the mayority of participants worldwide prefer monthly sessions, participants outside of North America seem to be keen to weekly sessions (Appendix 4).

Responses based on years in practice and practice location are available in Appendix 4.

Characteristics of Non-Interested Respondents

Only 15 participants (3%) expressed limited or no interest in participating in a coaching program. Of these, 14 (93%) were males, and seven (47%) stated they would not be a coachee but would be willing to coach someone else. Four (27%) would not participate in any way, two (13%) would be a coachee but not a coach, and two (13%) would not be a coachee but would be a coach if the program structure permitted.

Logistical constraints (8, 53%) were cited as the most important barrier for not wanting to participate, followed by a perceived lack of need (2, 13%) and fear of appearing unskilled or unqualified (1, 7%). Four (27%) participants did not report a barrier to participation. When asked how they perceived coaching compared to other modalities, answers were: more expensive (4, 57%), less convenient (4, 57%), less fun (3, 43%), less hands-on (3, 43%), and less patient-centered (2, 28%).

Discussion

This study reports the results of an international survey on the opinions and preferences of practicing general surgeons and related surgical subspecialists regarding peer coaching for continuous professional development. This is the first study to explore this topic internationally. The participants expressed an openness to peer coaching with no regional differences. Results of this survey can be used to inform the development of successful peer coaching programs in the future.

Effective continuing professional development is essential for surgeons to mainitain a high quality practice and to incorporate new procedures and techniques over the duration of their professional careers. According to our results, only a small percentage of surgeons are required to undergo formalized reassessments of surgical competency after their initial certification;, most countries utilize some form of credit system for maintenance of certification or practice privilges.[15,16]

Most traditional CPD activities rely on passive learning, such as journal reading, attending lectures, and watching videos created by others. These activities typically result in essentially negligible real practice changes.[9,17,18] As expected, most respondents to this global survey reported most often utilizing traditional CPD modalities. The most commonly-used interactive modality was attending hands-on courses, usually once per year. Only a small percentage of survey respondents currently participate in interactive co-learning activities with another surgeon, such as scrubbing together in the OR or reviewing videos with colleagues. The percentage of surgeons in this sample who regularly sought out

and received formal feedback was small. Despite the substantial advantages of interactive learning strategies over more passive CPD activities, these remain largely underutilized. Peer coaching for continuous professional development has been shown to result in durable changes in practice[7]. This is believed to be because this learning modality involves individualized, timely feedback per the learner's goals and current skill sets and is highly interactive.[19,20] Our results show that the opportunity to receive CPD credits would be a motivator to participate in a peer coaching program.

Our survey results are encouraging, as the large majority of respondents expressed an interest and openness to participating in coaching, both as the coach and the coachee., The most commonly-cited potential barriers to participation were logistical, such as scheduling issues, credentialling and case availability, rather than cultural barriers as reported in previous studies.[11,21] Few respondents to this survey expressed fears of judgment by peers or the risk of seeming incompetent as perceived barriers to participation in coaching programs, supporting that awareness and acceptance of peer coaching may be changing in surgery. These results are encouraging, future peer coaching programs may benefit from this change in climate by seeing greater uptake and enrollment, especially if professional bodies offer significant CPD credit for these activities.

Program design will be an essential factor to ensure participation and engagement. While other studies had already established that goal setting, personalized feedback, and longitudinal interactions are particularly important to improving practice change rates,[22] our study also found that potential participants had clear preferences concerning certain

structural aspects, such as characteristics of the coach, being able to set their own goals, being able to provide feedback to the coach, having the liberty to change coaches, flexibility of scheduling and location of the interaction.

While video-based coaching has been shown to be effective and feasible,[23,24] respondents to this survey overwhelmingly favored in-person live coaching in the operating room. This format has greater logistical hurdles to overcome, such as scheduling and credentialing issues, and widespread use may be limited compared to coaching interactions that can be done remotely and after the surgery. However, participants' preferences for live coaching might reflect the fact that many surgeries are not amenable to video recording or that there are aspects of the conduct of an operation such as communication, planning, and preparation[25] that are not easily captured by review of a video alone. Presumably, as peer coaching gains acceptance, various program formats will emerge, both live and virtual, to meet surgeons' different goals and needs in different contexts. Furthermore, due to the global limitations on travel and continued reliance on virtual communication platforms to replace in-person meetings, the acceptance of virtual coaching may continue to increase.

The importance of establishing rapport and cultivating mutual trust between coach and coachee ha been demonstrated in previous studies, [26-29] and the results of this survey support this. Most participants preferred to have a known colleague, chosen or accepted by them, as a coach. Participants also expressed a preference for knowing the skills and reputation of their coach. While none of our questions aimed to understand the ideal characteristics necessary to become a coach, recent studies have reported that coaching

skills, in any area but particularly in surgery, are not innate, and therefore must be taught and practiced.[27,30]

Limitations of this study include the sampling strategy and the possibility that respondents were self-selected to be interested in coaching while those who are uninterested simply did not participate. This is an inherent limitation of all surveys and is a trade-off to collect a large number of responses in a reasonable time frame. By disseminating the survey through numerous different international surgical societies, social media platforms and direct email, the opportunity to participate was disseminated to a large and varied cohort. While the survey received responses from surgeons internationally, just over half hailed from North America. This may limit the generalizability of the results and hindered our abilitity to perform in-depth statistical comparison by continent of practice. However, given the similarity of responses across regions, it is questionable whether greater representation from other regions would have meaningfully changed the results. The survey was designed in English and translated only into Spanish. While we explored translating it into more languages, most contacts at surgical associations globally felt their membership would be comfortable answering the survey in English. However, this may have impacted the response rate from other regions. Also, the survey was launched when most countries were recuperating from the first wave of COVID-19, which could have impacted the time and motivation surgeons had to participate.

Conclusions

This international survey of practicing surgeons demonstrated that peer feedback is rarely used in practice, but there is a very high interest and acceptance of the peer coaching model for continuous professional development globally. Findings regarding preferred program structure may be useful to inform the design of future peer coaching programs.

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Compliance with ethical standards

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CHAPTER V. EXPLORING A RECIPROCAL PEER COACHING PROGRAM

5.1 Preamble

In chapter 2, we sought to understand the situation around peer coaching. We found there was a very heterogeneous group of programs; we learned that practice change was higher, at 42-100%, than with common CPD modalities, and satisfaction after participation was positive. Our results showed that most programs had preestablished coaches considered experts in their fields and that the interactions were unilateral. Additionally, only a minority of programs had specific training to become a coach.

We then interviewed a local cohort of surgeons to understand their needs, desires, and barriers to peer surgical coaching. We found that surgeons prefer coaching in the OR, with a known coach. Contrary to the coaching programs available up to this date, our participants agreed that coaching should be reciprocal and that autonomy should be maintained. Additionally, all participants agreed that coaches should be trained in the coaching framework and mindset.

With the information gathered and by following the peer surgical coaching framework, we developed a reciprocal peer coaching pilot program to test its feasibility and understand the priorities and opinions of participants. All participants were given the autonomy to choose their partner, goals, and preferred format. Both parties involved were trained using the coaching frameworks, including goal setting, inquiry, feedback, feedforward, and the coaching mindset. The only instruction given to participants was that interactions needed to be reciprocal, meaning that both parties should play the role of

coach and coachee. After the interactions, surgeons were interviewed to collect their feedback and opinions concerning the program's structure.

Thus, our objectives were to develop, implement, and evaluate the feasibility of a reciprocal peer coaching pilot program and to assess the satisfaction, opinions, and implications for practice.

5.2 Manuscript 4: Reciprocal Peer Coaching for Practice Improvement in Surgery – a Pilot Study

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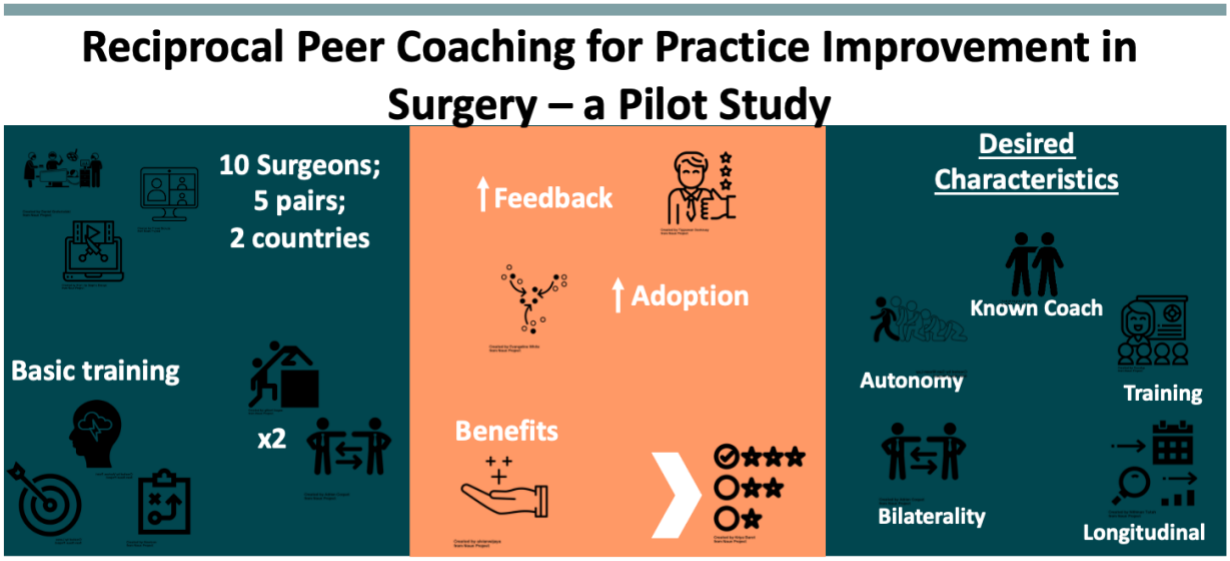

Fig. 5.1. Graphic Abstract

Abstract

Background. The need for ongoing skills development is well recognized in surgery, but common learning opportunities infrequently translate into real practice changes due to a lack personalized feedback. Peer coaching has been associated with much higher rates of practice changes and new skill implementation but bilateral peer coaching structures where seniority is not a requirement to coach have not been studied. The purpose of this study was to implement and evaluate a reciprocal peer coaching pilot program for practicing surgeons to inform future coaching program design.

Methods. A multicenter reciprocal peer surgical coaching program was designed according to the framework developed from previous studies by our group. The coach-coachee matching process was voluntary and autonomous. All participants received basic coaching skills training. Pairs were instructed to complete two coaching sessions, alternating between the coach or coachee role for each session. Data was collected through questionnaires and structured interviews.

Results. Of 25 surgeons who were invited to participate, 22 participants enrolled in the pilot study and completed the coach training (88% enrollment rate). During the first wave of COVID19, 12 participants withdrew. Of the 5 pairs that completed the program, three pairs were composed of general surgeons, one of orthopedic surgeons, and one ophthalmologic surgeon. Three sessions were conducted live in the OR, five virtually, and one involved an in-person discussion. Overall satisfaction with the program was high and all participants expectations were met. Participants were significantly more likely to predict "routinely" asking for feedback from their partner after study completion (6, 66%)

compared to pre-intervention (p = 0.02). Analysis of semi structured interviews revealed that participants had a better understanding of what coaching is, citing aspects like guidance, self-assessment, and self-reflection, and the unexpected side benefits of coaching. Participants agreed that virtual sessions where feasible, but the OR is still the preferred location. Equal training in coaching skills was agreed to be a valuable aspect of the program, with all participants feeling everyone should be allowed to be a coach if desired. Agreement of the benefits of the program for patients came out, however participants acknowledged the personal growth and side benefits acquired can be translated to other areas in life.

Conclusion. This pilot study demonstrates the feasibility of a peer coaching model for surgeons in practice that emphasized reciprocity and participant autonomy. These key elements should be considered when designing future coaching programs.

Keywords: surgical coaching, reciprocal coaching, peer coaching, continuous professional development

Introduction

Achieving mastery in surgery depends on maintaining and advancing surgical skills once formal training is over. During residency, trainees are exposed to continuous guidance and feedback from experienced surgeons responsible for their training and evaluation. Once training ends however, this process practically ceases and surgeons are left to develop their skills largely in isolation for the duration of their careers.[1-3] In addition, most traditional continuous professional development (CPD) activities, such as journal reading and lecture attendance, are not interactive and lack personalized feedback, thereby rarely translating into real changes in practice.[4]

Recently, educators have shown increasing interest in using peer coaching as a means to provide the personalized feedback needed to move the needle on practice improvement in surgery.[5-7] Formalized coaching has been shown to improve technical skills and outcomes over and above traditional training among trainees[8,9], and participation seems to translate into real practice changes[10] among practicing surgeons. Implementation has been proven feasible,[5,6] and studies with certain aspects similar to peer surgical coaching have proven to be useful in disseminating and implementing surgical programs, such as the enhanced recovery after surgery.[11]

While peer surgical coaching has been positively perceived[10,12] and a recent worldwide study found that receptivity to surgical coaching is high,[13] it remains unclear how to design and implement a widely acceptable program across the surgical spectrum. One of the key characteristics is the coaching relationship. Studies in executive coaching have made it clear that coach-coachee matching is critical for long-term success.[14] Despite

one study demonstrating that participants acquire a reciprocal coaching relationship naturally,[15] most pilot studies have selected senior surgeons as coaches, and roles have been established before beginning the program,[7,16-19] limiting widespread uptake of such programs due to small numbers of "coaches" and potentially limiting participation by propagating stigmas that only junior surgeons benefit from coaching. To date, reciprocal peer coaching structures, where seniority is not a requirement to coach, have not been studied.

Therefore, the purpose of this study was to implement and evaluate a reciprocal peer coaching pilot program for practicing surgeons to inform future coaching program design.

Methods

Program design

A multicenter reciprocal peer surgical coaching program was designed according to the framework developed from previous studies by our group.[12] Figure 5.2 shows the overview of the program. The coach-coachee matching process was voluntary and autonomous. Both virtual and in-person modalities could be used for the coaching interactions. After undergoing formalized training in coaching, pairs were instructed to complete two coaching sessions, taking the coach or the coachees' role for each session. Each pair was given the autonomy to set the goals, format, and timeline of the sessions. However, surgeons were asked to follow the GROW[20] and SMART[21] models and the coaching mindset discussed in training for both sessions.

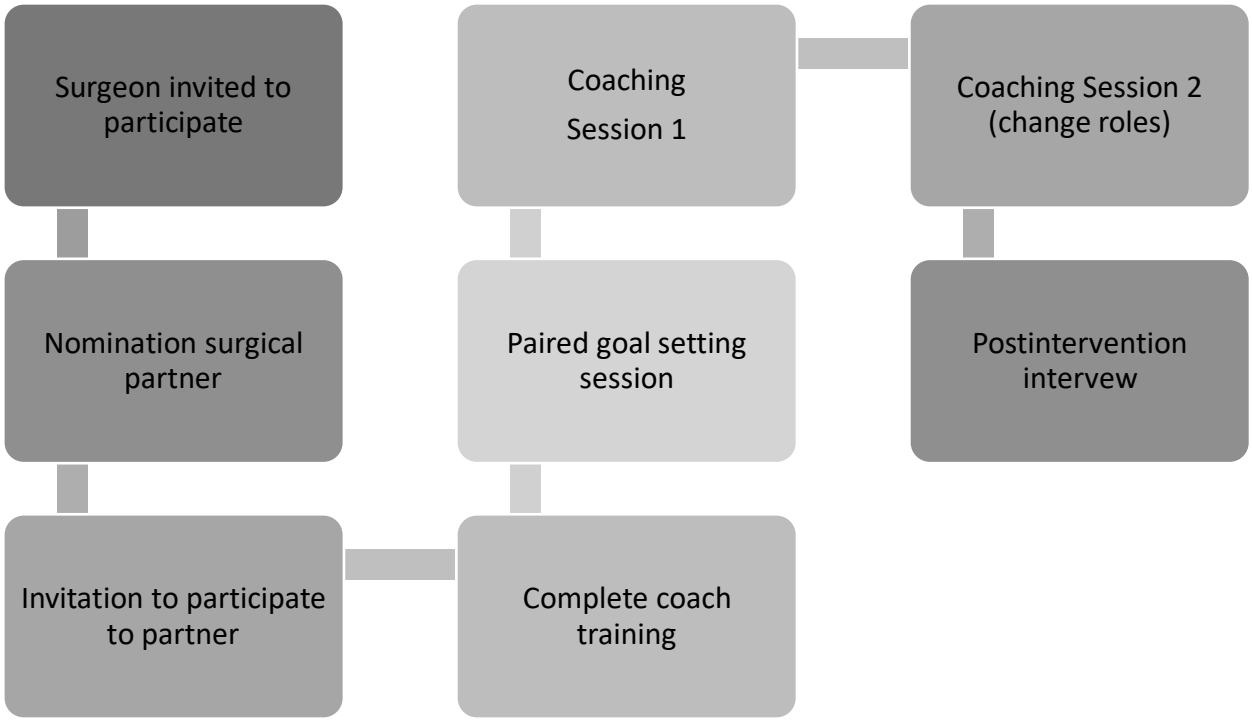

Fig. 5.2. Program design

Participant recruitment

Surgeons licensed for independent practice by their regional licensing authority in specialties recognized by the American Board of Surgeons were eligible for study enrollment. Participants were selected for recruitment based on expressed interest in participation. When participants accepted the invitation, they were asked to nominate two or three surgeons, in order of preference, with whom they would want to be partnered. The nominated surgeons were approached one by one to explain the purpose of the study. Once agreement was reached on partnership, study consent was signed. The first cohort of participants was recruited in January 2020, but due to work disruptions resulting from

COVID-19, a number of original pairs dropped out and a second cohort of participants was recruited in October 2020.

Training

After enrollment, participants underwent a two-hour training session regarding coaching best practices by either a Professional Certified Coach (DK) or a member of the research team (SV), certified by the Academy of Surgical Coaching.[22] Training sessions emphasized using the GROW model for coaching sessions the acronym stands for goals, reality, options (for barriers), and will (for the way forward).[23] The use of the SMART model was also emphasized for goal setting. The SMART acronym calls for goals that are specific, measurable, achievable, realistic and time-based.[21] Training sessions also highlighted the "coaching mindset" which asks the coach to remember that the coachee and their goals always drive the agenda[22]. Training included: learning how to listen and what types of questions to ask, understanding how to give feedback, and how to establish feedforward. [24] A handout summarizing training content was provided to participants for later reference, and they were instructed to contact the coaching trainers in case of questions.

Coaching sessions

Participants were asked to provide researchers with the date of the sessions and the role they would play. Surgeons were informed they could scrub in to or observe the surgery, use a pre-recorded video, or coach non-technical skills, depending on their needs and goals. Goal setting could occur on a separate interaction previous to the first session. On the day

of the session, participants received a REDcap survey link with a coach/coachee log to be completed after each session.

Definitions

To ensure a homogenous understanding of terms, participants were given the following definitions:

Coaching was defined as "a process whereby an experienced and trusted role model, advisor, or friend guides another individual in the development or self-reflection of ideas, learning, and professional development, working with mutual goals, and providing support for changes in practice."[10]

Feedforward was defined as "a process that provides images of future behaviors, options, and solutions with the purpose of creating performance improvement." [24]

Data collection

REDCap is a secure web application specifically geared to support online and offline data capture for research studies. REDCap and SurveyMonkey are GDPR (general data protection regulation) and HIPAA (Health Insurance Portability and Accountabilty Act) compliant. All questionnaires were collected through REDCap. After training, every participant was asked to fill out a demographic form and pre-intervention questionnaire (Appendix 1). On the day of the coaching session, each participant received an e-mail with a link to the specific log. After the two coaching sessions were complete, surgeons received a post-intervention questionnaire link (Appendix 2). Both the pre-intervention and post-

intervention questionnaires used a 5-point Likert scale to evaluate the needs, motivations, barriers, structure, and training, as well as open questions exploring expectations and emotions. On program completion, one author (SV) conducted one-on-one semi-structured interviews with each participant to evaluate the experience and receive feedback and recommendations regarding future program design. Interviews lasted 20 min and were conducted virtually via Zoom. Questionnaires and semi-structured interviews were available in both English and Spanish. Surgeons who withdrew from the program were asked to fill out an anonymous 5-question survey via SurveyMonkey to understand the reasons for withdrawal and any future expectations for participation.

Data analysis

Data from REDCap logs and SurveyMonkey were downloaded for local statistical analysis. Interviews were recorded and transcribed verbatim. Logs and interview transcripts were deidentified before analysis. Quantitative data from survey responses were analyzed using descriptive statistics, including means with standard deviations and maximum and minimum values. Student's t-test was used to compare responses before and after study participation. Qualitative data were analyzed according to grounded theory methodology by two independent researchers (SV, JM), with the senior author (CM) serving as a tiebreaker in the case of disagreement. Interview and log data were coded into themes developed based on prior research by our group[12], and themes were expanded as new trends emerged.

Ethics and funding

The research protocol was approved by the Institutional Review Board at McGill University. This research is supported by a Royal College of Physicians and Surgeons of Canada Medical Education Research grant (2017-RC-MERG).

Results

Participant demographics

Of 25 surgeons who were invited to participate, 22 participants enrolled in the pilot study and completed the coach training (88% enrollment rate). During the first wave of the COVID-19 pandemic, 12 confirmed participants (55%) withdrew from the study. The most common reason for withdrawal was lack of appropriate cases and/or diminished OR access (10; 83%), while two participants received promotions to demanding administrative positions and felt they no longer had time to continue with the study.

Ten surgeons (5 pairs), of whom 7 (70%) were male, finished all coaching sessions. Eight surgeons served in both the coach and coachee roles, while two surgeons only performed one role as mutually agreed by the pair. Three pairs were composed of general surgeons, one pair of orthopedic surgeons, and one pair of ophthalmologic surgeons. None of the surgeons had participated in a surgical coaching program previously. Participant characteristics are presented in Table 5.1.

Table 5.1. Participant Demographics

	N	%
Total participants	10	100%
Male	7	70%
Female	3	30%
Specialty		
General Surgery	6	60%
Orthopedics	2	20%
Ophthalmology	2	20%
Fellowship		
Yes	9	90%
No	1	10%
Years in Practice		
0-5 years	3	30%
6-15 years	3	30%
15-25 years	3	30%
>25 years	1	10%
Place of Practice		
Canada	4	40%
Mexico	6	60%
Type of Practice		
University Affiliated	7	70%
Private Practice	3	30%

Questionnaire Data

Pre-intervention opinions regarding peer coaching in surgery

A total of 15 participants, including withdrawals, completed the pre-intervention questionnaire (Appendix 5). The idea of a coaching program, in general, was highly rated, with all participants rating the need for such a program as "above average " or "great " (13, 86%). Most participants found the idea of implementing a surgical coaching program to be "very appealing" or "extremely appealing" (12, 80%). However, the majority predicted the implementation of a surgical coaching program to be "difficult" or “challenging” (13,86%),

while only two felt it would be "fairly easy" (2, 22%); with the universal applicability rated as "neutral" (9, 60%) and "likely" (4, 26%).

The perceived change in relationships was viewed as positive, with a perceived improvement after the program. There was a consensus that the surgeon participating in such a program would be perceived positively by the surgical team. Only a small percentage of participants said they "routinely" ask for feedback (3, 20%), with the majority stating that it occurred "often" (8, 53%) or "sometimes" (2, 13%).

All participants who were still active clinically expected coaching to have a positive impact on their practice, and all respondents felt the goal-setting exercise done during training was very helpful.

Regarding feelings about being observed and receiving feedback, most were positive, participants expressing feeling: optimistic (10,66%), excited (5, 33%), happy (3,20%), and hopeful (5, 33%); nervousness (3, 20%), anxiousness (3, 20%), and fear (2, 22%) were reported less frequently.

Motivations to participate in the program were to enhance current skills (13, 87%), to improve patient care (9, 60%), to acquire a new skill (8, 53%), to find a new CPD modality (6, 40%), because it was relevant to their practice (3, 20%), and for enjoyment (3, 20%).

Regarding anticipated barrier to participation, logistical barriers were the most prevalent, including scheduling conflicts (12, 80%), lack of time (9, 60%), lack of cases (6, 40%), geographical barriers (6, 40%), and remuneration concerns (1, 1%). One participant expressed surgical culture as a barrier citing *"hierarchical obstacles, the coach may want to impose their knowledge, particularly if they are older."*

Session logs

According to the coach/coachee logs (Appendix 6), three sessions were conducted live in the OR, five were done virtually, and one in person at the hospital. Six sessions were focused on technical skills and four on non-technical skills (Table 5.2).

When participants undertook the role of a coach, they felt calm (4/9), happy (2/9), comfortable (2/9), and anxious (1/9). The most meaningful things participants commented they gained from the interaction were communication skills (5/9), understanding reciprocal learning (5/9), and the importance of self-assessment (1/9). On self-reflection, participants felt they could improve their coaching by being more patient and not rushing the coachee (5/9), giving better feedback (3/9), and better organizing their thought processes (2/9).

Table 5.2. Session Summary

Pair	Location Session 1	Focus Session 1	Location Session 2	Focus Session 2
1	OR	Technical skills (procedural)	Virtual	Non-technical skills (administrative)
2	In-person	Non-technical skills (use of software)	OR	Technical Skills (procedural)
3	Virtual	Technical skills (physical exploration)	Virtual	Non-technical skills (administrative)
4	Virtual, video review	Technical skills (procedural)	Virtual, video review	Technical skills (procedural)
5	OR	Technical skills (procedural)	NA	NA

As coachees, participants most frequently reported choosing their partner as a coache because of their expertise (6/9) and because they trust them (3/9). Every participant commented on their particular actions or gains after the session, including technical and non-technical aspects, as well as personal improvement. They found that the best thing their coach did was provide good feedback (3/9), listen (2/9), stay calm (1/9), share their experiences (1/9), be respectful (1/9), be patient (1/9), and *"reassure me"* (1/9).

Post-intervention opinions regarding peer coaching in surgery

Nine (90%) participants completed the post-intervention questionnaire (Appendix 7). Overall satisfaction with the program was high (moderately satisfied 1, 11%; very satisfied 2, 22%; extremely satisfied 6, 66%). All participants' expectations were met, all found the experience valuable and all enjoyed the experience and noted they would participate in future programs.

After the intervention, all but one participant felt their was a "great need" (6, 66%) or "above average need" (2,22%) for wide-spread adoption of peer coaching for practice improvement in surgery (p = 0.22). The perceived feasibility of peer coaching being routinely adopted into practice improved slightly compared to the preintervention opinion, but participants still feel it would be "challenging" (5, 55%; p = 0.01). Participants were significantly more likely to predict "routinely" asking for feedback from their partner after study completion (6, 66%) compared to pre-intervention (p = 0.02). As for clinical practice, participants agreed that the intervention had "somewhat of an impact" (3/9, 33%),

a "moderate impact" (3/9, 33%), a "significant impact" (2/9, 22%), and a "slight impact" (1/9, 11%) (p = 0.17).

When asked about their feelings while being observed and having feedback, most feelings were positive, such as optimistic (6, 66%), excited (5, 55%), happy (3,33%), hopeful (5, 55%), with nervousness (3, 33%) and anxiousness (1, 11%) being reported less frequently. Having a first session to establish goals and rapport made most participants feel more comfortable (6, 66%). Three participants (33%) expressed being less comfortable as a coachee than as a coach.

Statistical analysis showed no significant difference in opinions from the pre-intervention to the post-intervention questionnaires, except for the adoption and feedback questions. Table 5.3.

Table 5.3. Comparison of mean pre-intervention and post-intervention opinions (Likert scale 1-5)

Code	Pre-intervention			Post-intervention			
	Mean	SD	Min, Max	Mean	SD	Min, Max	*P*-value
Need (Q1, Q1)	4.3	0.5	4,5	4.6	0.7	3,5	0.22
Adoption (Q5, Q3)	3	0.7	2,4	3.4	0.5	3,4	0.01*
Applicability (Q6, Q9)	3.4	0.5	3,4	3.6	0.7	3,5	0.29
Relationship (Q7, Q4)	4.6	0.5	4,5	4.4	0.9	3,5	0.39
Impact on practice (Q12, Q10)	4	1	2,5	3.7	1	2,5	0.17
Feedback (Q13, Q11)	4.1	0.8	3,5	4.7	0.5	4,5	0.02*
Compare to a lecture (Q2, Q2)	4.3	0.7	3,5	4	1	3,5	0.09
Compare to a video (Q2, Q2)	4.1	0.6	3,5	4.2	0.83	3,5	0.29
Compare to a hands-on course (Q2, Q2)	3.2	0.4	3,4	3.4	0.5	3,4	0.08
Compare to reading peer-reviewed literature (Q2, Q2)	4.2	0.8	3,5	4.4	0.9	3,5	0.08

Codes are based on the pre-intervention and post-intervention questionnaires of participants that finished the program, with specific question numbers in parenthesis. *Statistically significant was considered as p-value < 0.05

Semi-structured Interviews

Responses were organized around *Understanding Coaching, Prefered Design and Program Format, Perceived Benefits to Coaching, and Barriers to Coaching Participation* according to a previously published framework[12].

Understanding Coaching

All participants agreed that after participation in this program, they had a better understanding of what coaching is, citing aspects like guidance, self-assessment, and self-

reflection, and the unexpected side benefits of coaching. Understanding that your partner is your peer and not your student and how to have a non-threatening conversation also came up. One participant expressed the meaning of coaching should be rectified to not misunderstand it. Sample statements reflecting these thoughts included:

"This is just part of surgical practice, it should be done every day in the OR . . . we have the opportunity to reflect on that while its happening, sort of like an out of body experience... I thought it was quite unique."

"I got something out of it that was more important than what I had planned or expected; that was something that I thought, you know, is maybe one of the side benefits of doing this kind of thing."

The *coaching mindset* was also commented on by six participants:

"I adjusted the way I asked questions as a coachee and presented the information as a coach. I learned how to pay attention to the other's needs."

"It changes your mindset completely. You are there to listen and help them self-reflect, you give them tips, but the idea is to have a two-way conversation."

Preferred design and program format

Having a standardized *structure* came up five times; participants believe having an established start and finish line would be much more helpful for surgical personalities. Sample statements reflecting these sentiments included:

"I was very relaxed, casual, I would have liked a more like formal thing to follow the way you are asking me questions right now, it would be nice to have a bit more of structure to it."

Most participants (9/10) agreed that the *preferred location* would be the OR. However, agreement on using technology when available was also discussed and viewed positively.

"I prefer in the OR; I think it's much more useful. . . yes, it can lend itself to video, but I think the OR is definitely better."

"It made me think of all the things we could be doing remotely that we haven't even thought of... it could work out."

All participants agreed that coaching programs should be *longitudinal* in time with comments such as *"I think that it would be useful to come back and see what has happened in that respect [personal goals] after a set time"* and "*I have learned a lot, just need some repetition and to have another chance to perform with his guidance"*

Only two participants expressed that *remuneration* for time should be an important part of the design. All participants agreed they would be more likely to participate if peer coaching were eligible for CME credits with one participant stating: *"it's easier to do if it's a CME and they say you have to achieve it within one or two years . . . even better if they give you a detailed something that you need to be coached for a total of, let's say, 15 hours in two years..."*

Participants agreed that *reciprocal interactions* should occur only when they are naturally occurring; everyone agreed that they should not be forced.

"Even if the coach does not think they are being coached, they are..."

"While in the session, I started to think, wow, I can also use everything that ... is saying and reflecting on in my own work; I now understand that we both learn."

"I don't always want to coach my coach, you know; I think I can be a better coach to someone else sometimes; it's like I don't give therapy to my therapist!

Equal training to level out the playing field was mentioned multiple times; participants agreed everyone should be trained to become a coach and be allowed to be a coach if desired.

"... it wouldn't be ok to be the coach or the coachee all the time, it goes back to only experts being able to teach you something, and who teaches them?"

"It allows you to play both roles, and that role-playing is going to force you to self-analyze and get better."

Most participants (9/10) agreed that in order to be a good *coach characteristics*, such as being a good communicator, were required. They also agreed that training is an integral part of obtaining coaching skills. Comments revolved around standardizing coaching, just like we do surgery and that we are not born with coaching skills. One participant commented on the importance of giving anyone who was interested the opportunity to become a coach, while another commented that only someone with specific criteria could be a coach.

“It's something you have to develop, the intention is to unify, so even if you have been in practice for years, we should all get the same basic training."

“. . . anybody who wants to be a coach. I think it would be valuable to have a preparation for the coaching interaction that will sensitize people to some of the issues . . .”

"Maybe potential people could actually meet certain criteria. Perhaps expertise in terms of familiarity with the cases and things like that, maybe have their own outcomes published in their field, something that makes them respectable or worthy of respect."

All participants agreed they would want input in *choosing* their coach, with no participants feeling comfortable with a coach being assigned to them. Knowing the skills of the person who would coach them, even if they did not have a personal relationship beforehand, was also expressed:

"No, we should always choose."

“The problem is not someone I don't know personally, its someone I don't know of . . ."

The optimal *characteristics of coachees* were discussed infrequently, with only two participants commenting on this topic. Both participants agreed that coachees must be willing to be coached and receive feedback. A statement reflecting this thought was: *“The coachee needs to be open to being coached; if not, it doesn't matter; it won't work."*

All participants agreed a session to establish *rapport and goals* before the start of a coaching program would be important, particularly when a "stranger is coaching you." Four

participants commented on how these interactions can improve relationships among your team even if you already know and trust them. All participants agreed that, if a relationship between coach and coachee does not already exist, time to establish rapport would need to be built into the program before the coaching sessions begin.

"That first meeting is crucial, you know, making sure that the match is good and that the people are going to make it a successful interaction."

"We have only been working together for [a few] months, but after this exercise, I feel like we opened up more to each other; there is more trust and fewer communication issues."

"It's difficult, you know? Even when you work with someone closely, having a good relationship inside the OR is difficult, but I think these types of dynamics help."

<u>*Training*</u> was brought by all participants, with agreement that both coaches and coachees should receive the same training. The discussion revolved around using the tools provided, needing short videos or examples, having refresher courses, and preparing for each session. One participant commented that the amount of information provided in the coaching training session was huge and there was a recommendation that it bedivided into more sessions. Almost all (8/10) participants expressed an interest in an online program that could be completed independently at one's convenience. Only one participant said that training could become another barrier because of the time commitment it entails:

"I think watching a live or video of a real session, but not done by a coach, but like by a physician, where time is limited, and it's more relevant to our lives."

"I really think having some sort of online program to prepare people, and they can go back to it, you know, having it as a reference, I think that could be useful."

One participant commented on not getting *feedback* as a coach and how important that would have been. *"I think one important thing that could help is to have the sessions recorded, and then I can get the perception from you on what things I could have done better, not from the coachee and not from my perception, but from our facilitators."*

Benefits to participation

All participants agreed that the benefits of coaching included *care evolution, enhancing patient safety, and achieving expertise*. Three participants acknowledged the technical benefits of surgical coaching and the *personal growth* and side benefits you can acquire and translate to other areas in life. Two participants agreed that coaching could be more important than other modalities.

"I think it can be more important [than a meeting] . . . with coaching you feel the progression, get your questions answered immediately, and potentially get help achieving the next step."

"Even if it's virtual, you can get so much knowledge and richness out of a one-on-one session with your peer."

"You know it's like the knowledge you gain in residency, but now nobody is your teacher; I feel it's even better."

"You know, yes, it is for the patient, but more than that, on a personal level, it's for us; we get better in every way."

"... I got things out of this I would not have been able to get from independent modalities (e.g., reading). The presence of the coach in the room really helped me reflect on my practice in ways I had not had the chance to really do previously."

Barriers

Logistical barriers to coaching participation, such as time and lack of cases, were brought up four times, including:

"I think the biggest barrier from a logistics perspective is to get two attendings to scrub in on a case where they wouldn't otherwise have to, so to manage their time, the economic issues, etc. If you take all that away, it's terrific."

Surgical culture barriers, such as feeling or being seen as incompetent, came up on two independent occasions:

"It's this tabu of if I make a mistake, then that means I am incompetent...."

"It's not that you don't know, it's that you want to be better than you already are."

"This experience reduced my fear of not knowing ..."

Five participants talked about *coaching dynamics*, such as ego and hierarchical issues. Quotes expressing these sentiments included:

"Learn to accept and ask for help... there is nothing wrong with that."

“It’s scary to tell them what I think; you know I just graduated; I have no right telling him if something can be done in another way."

“We need to eliminate hierarchy because if only someone in particular can be a coach and I am the student again, I might as well do a fellowship."

<u>*Perceived lack of need*</u> was not explicitly mentioned as a barrier, but one participant commented on learning we do not know everything after graduation. *"You have to understand that just because you graduated doesn't mean you have the absolute truth."*

Finally, participants were asked what they thought could help them avoid potential barriers, answers included: *"making time," "scheduling sessions in advance,"* and *"making time because you want to learn and have a good experience," "using zoom,"* practicing with *"healthy patients or at the SIM center" and finally the idea of "exchanging roles . . ."*

Satisfaction

All participants agreed that the experience was positive, and they would likely participate again if a program like this were established. One participant commented they would establish a coaching program with their own team to reap the benefits. Examples of *participant satisfaction* quotes include:

“I found the experience enriching; it works, and we just have to accept it."

"It was good. I'm planning on doing it now, like once a month at least, even if it’s just within my team."

"It's a very good method for personal and professional growth."

"It was probably more beneficial in a different way than I could have planned for."

"This project is really good; this is one of those things that I feel can really change the way we practice surgery; it would benefit us all."

"I truly had fun"

Discussion

This study describes the initial experience of a unique peer coaching program for practicing surgeons that provided autonomy, reciprocity, and bilaterality to participants. To our knowledge, this is the first study to explore reciprocity and bilaterality to improve the coaching dynamics. Interestingly, while the whole experience was rated positively, reciprocity itself was not highly valued unless it occurred organically between study pairs. Despite this, participants felt bilaterality to be an essential feature in designing peer coaching programs in order to solve issues of hierarchy and cultural stigmas in surgery such as being perceived as "needing" coaching and thus perhaps being labeled as incompetent. In addition, all participants felt strongly they would only accept coaching from someone they knew of and respected, and all wanted to have some input in choosing their coach. Results of this pilot may be useful to guide the development of successful peer coaching programs in the future.

Participants in this study came from two countries in North America with a different surgical system. Co-surgery happens in Canada primarily for "complex cases," while most Mexican surgeons almost always operate with another surgeon[13]. However, all participants

agreed that, no matter the conditions in which they operate, following a structure to establish goals and receive formal feedback is not usually done in the day-to-day surgical practice and is greatly beneficial.

The commitment to lifelong learning is an essential characteristic of surgical practice, and its main purpose is to ensure competence and quality patient care[25]. Historically, CPD modalities have been didactic and sporadic. Research has shown that traditional CPD has a high rate of knowledge acquisition. However, there is still a gap between what surgeons know and what they do, so traditional CPD may not enable long-term practice change.[26,27] Research in the field of professional development has shown that the addition of coaching to traditional knowledge acquisition modalities can increase the rate of practice change to up to 95%.[28] The need for coaching, impact on personal relationships and clinical practice, and comparison to some CPD modalities were highly rated among participants before the program began, demonstrating that surgeons who voluntarily enrolled in this study were likely looking for an effective CPD modality that provides feedback and brings forth changes in practice.

Participants were given autonomy to structure their sessions as they needed. Interestingly, all sessions were conducted in different manners, from the OR, the hospital ward, virtually, and with video review. Although most participants preferred having sessions in the OR when possible, all were open to virtual/online coaching also. Live coaching in the OR has been reported as the preferred method by surgeons[12,13] and allows for the development of communication, preparation, patient selection, leadership and teaching skills that would be difficult to capture through video review alone. However, this

format leads to challenges in scheduling, credentialling and privacy not encountered through video-based coaching. No matter the format, like with previous studies,[29,30] participant satisfaction was high with all participants reporting being likely to participate in similar initiatives in the future, demonstrating peer coaching is feasible and appealing in several different formats.

This study was designed to explore the feasibility of reciprocal peer coaching. Previous coaching programs have mostly employed a unilateral coaching dynamic whereby participants are designated as either coaches or coachees. Such a format is limited by the short supply of "experts" to serve as coaches and the potential stigma coachees may feel if they are only receiving coaching, leading them to potentially feel they have nothing to offer a peer with respect to technique or expertise. A previous study[15] found surgeons in coaching programs naturally alternate roles and transition to a co-learner dynamic, indicating a bilateral exchange of ideas is perhaps more comfortable than dynamics in which feedback is only given in one direction. Indeed, several studies have noted the coaches often comment that they learn a great deal from the coachees, demonstrating a bilateral relationship may be both practical and desireable. However, participants in this study all felt that reciprocity is something that occurs naturally and should not be forced. Therefore, it may be more desireable to encourage all participants to serve as both coaches and coachees, but not necessarily with the same partner depending on their individual goals and skill sets. This model may also serve to reduce issues of hierarchy which can be a barrier to coaching participation.[7,15,31,32]

Several studies have reported surgical culture,[10,12,33] such as fear of appearing incompetent, and logistical barriers[6] to be the most common barriers limiting surgeons' participation in a coaching program. Additionally, other studies have found that a perceived lack of need[12] and relationship dynamics[12,34] also affect participation. We asked participants to reflect on the barriers they encountered and provide us with practical solutions. Logistical issues were the most commonly encountered barriers in this pilot, and suggestions to overcome them were as simple as scheduling a protected coaching time every month, using virtual encounters, or paying the coach for the time they spend away from the clinic. Another solution, although not directly achievable at this level, is to provide participants with CME credits for participation with an established timeline for participation. Surgical culture, perceived lack of need, and relationship dynamics were not commonly encountered in this study although they have been described as barriers in previous studies.[10] No participants believed their relationships would be tarnished or that their team would judge them badly for receiving coaching, which was probably because these participants had already accepted the coaching mindset and were motivated to participate. Amongst those who withdrew from the program, these stigmas were not cited as reasons for withdrawal either, although participants might not acknowledge these fears to the research team even if they were present. Based on the responses to semi-structured interview questions, the coaching training and autonomy to choose one's own study partner seemed important to avoid hierarchical and cultural barriers to participation reported in other studies[33]. Creative solutions for surgeon buy-in and non-punitive approaches will be necessary to solve the perceived lack of need.

Limitations of this study include the small number of participants however, as this was a pilot study to test the feasibility of the program model, enrollment was intentionally kept to no more than 6 pairs. The COVID-19 pandemic negatively impacted the study in several ways, including delaying completion by nearly 12 months. Nevertheless, changes to the study protocol to expand enrollment beyond the home institution and to allow virtual/remote coaching allowed us to overcome these challenges and complete the study. The responses and preferences of participants in this study may not reflect those of all surgeons, as participation was voluntary and subjects were therefore motivated to participate and thus more likely to rate the program favorably. However, responses of participants in this study mirror those reported by other studies of surgeons in general[12,13] and therefore the opinions reported here can be relied upon to benefit future coaching program design. Additionally, this pilot was a peer coaching program for the improvement of a skill. Therefore, the findings here may not be translatable to coaching programs geared towards acquiring new skills.

Conclusions

This pilot study demonstrates the feasibility of a peer coaching model for surgeons in practice that emphasized reciprocity and participant autonomy. These key elements should be considered when designing future coaching programs.

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Compliance with ethical standards

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CHAPTER VI. SUMMARY AND CONCLUSIONS

6.1 General Findings

The need for continuing professional development in surgery is well established. In recent years diverse reports, such as the Future of Medical Education in Canada Continuing Professional Development (FMEC CPD) Project[91] and the ABMS initiated Continuing Board Certification: Vision for the Future,[92] have established that continuing professional development should focus on quality improvement and be designed to improve patient care. Some of the key recomendations include translating learning into day-to-day practice, aligning learning with delivery of care, using practice data to improve, receiving feedback and developing a sense of community.[91] In this vision, peer surgical coaching has garnered attention as a stategy for practice improvement.[93] Coaching has shown to improve performance, which in turn can produce better patient outcomes. However, to this date there are few established formal peer surgical coaching programs, and uptake still seems slow worldwide[94]. Barriers to participation are prevalent and there is no standard structure to follow when designing a program.[87,94] This work provides a framework to help design successful coaching programs and address some of the most commonly encountered barriers.

As a first step, in Chapter 2 we examined the available literature on coaching for practicing surgeons. Historically, coaching outcomes have been studied in trainees and medical students. Additionally, there is still a misunderstanding between coaching, mentoring, and proctoring, and the terms may be used interchangeably. Only 27 articles

met the inclusion criteria, most of them from North America, and location varied between simulation centers, wet labs, and video reviews. We found a reported change in clinical practice that ranged between 42-100%, higher than the reported percentage for other CPD modalities. Additionally, participant satisfaction was reported as positive in all studies and ranged from 82-100%. Some studies also reported the encountered barriers, such as logistical and surgical culture issues. Since the completion of this manuscript, a group of researchers attempted to measure the impact of coaching on surgeons performance[95]. However, the program was only completed by 48% of their participants and they could not detect any measurable variation in technical skill. Although studies included in our manuscript did show improvement in skills in simulated settings, there is still a lack of concrete evidence of improvement for live coaching in the OR. Qualitative studies have reported, in line with the results of our systematic review, an improvement in non-technical skills and a self-perceived change in technical skills, which could indirectly change clinical practice and benefit patient care.[95,96]

In Chapter 3 and 4 we explored the needs, motivations, and barriers to peer coaching along with the desired characteristics for program implementation. Chapter 3 focused on the opinions of a local cohort of surgeons. Based on the results we constructed a thematic framework for future research. The data suggested that surgeons prefer to have a coach they know of instead of a stranger in the OR providing feedback. Particular opinions about the qualities of a coach were addressed, and participants expressed the need to have training to become a coach, aside from the skills and expertise in the field. New data about barriers emerged from this particular study. Perceived lack of need and relationship

dynamics as barriers had not been previously reported. However, our participants felt that issues like hierarchy and egos could affect the general outcomes of coaching. On this topic, a very recent qualitative article explored surgeon perceptions and found that unintended hierarchy that came from pairing an expert with a coachee could hinder the initial interaction.[96]

Although we believe and have experienced a similar surgical culture worldwide, certain aspects like certification, government requirements, and practice environments may be different. Therefore, using our previous data and thematic framework, we decided to explore the opinions of surgeons worldwide. To our knowledge, there has not been an exploration of this kind before. Our results, in Chapter 4, demonstrated that currently most feedback is done informally and sporadically. Additionally, the most used CPD modalities include those that are didactic, and lack feedback, including attending lectures and watching surgical videos posted by others. Hands on courses and review of videos with feedback were infrequently used. This information provides a wider scope into the professional development of surgeons worldwide and relates to the recent report by the American Board of Medical Specialties.[97] This report states that the CPD modalities used for board certification are not sufficiently effective for practice change and emphasizes developing and adopting modalities that can be longitudinally assessed and provide timely feedback.

Interestingly, we found a great interest for participation in coaching programs worldwide (>80%), with no particular differences in characteristics, needs, or barriers between continents. Our results show that surgeons are willing to be coached or coach an

average of once a month, live in the OR, but require autonomy to choose their goals and coach. Surgeons were particularly keen on being coached by someone they knew or knew of, as with our previous study, and relative age of the coach did not matter. Surgical culture, lack of need, and relationship dynamics barriers did come up but were cited less of a problem than logistical issues.

By Chapter 5, we understood that the success of a coaching program would depend on a design that aligns to surgeons′ preferences. Therefore, we designed a peer reciprocal coaching program that provided surgeons with the necessary training in coaching, but also with the autonomy to choose their partner, goals, and structure of the program. Unlike other studies there were no pre-established roles and both parties were both the coach and the coachee. One study had previously reported the natural behavior of surgeons in coaching interactions[73] and found that interactions tended to be reciprocal and bilateral by nature. During the time our pilot program ran, two studies[95] published the results of their pilot program. Both studies trained all participants in the principles of surgical coaching but had pre-established roles with no alternation.

Similar to other studies we found a high satisfaction rate among our participants. Participants were particularly keen of the autonomy provided. Contrary to what we believed, reciprocity was welcome only when it was naturally occurring. Participants felt bilaterality should be respected, by training all interested parties and providing them with the opportunity to coach if they wish. This characteristic was viewed as a facilitator against hierarchical issues. Similarly, a recently published article reported participants feeling that pairing should be done equally, without giving one party the responsibility of being a coach,

thus, not using pre-established roles and letting participants decide.[96] Although the structure of our program did not permit for, there is a study that has shown that multiple interactions among surgeons are possible and important.[95]

Since the initiation of this thesis, other authors have implemented small pilot programs and attempted to improve participation by optimizing design through feedback. However, we have developed a conceptual model, explained further on, which may provide a stencil to structure future coaching programs.

6.1.1 Definition of Peer Surgical Coaching

In this thesis, we identified and described surgeons' needs, desires, opinions, and barriers to surgical coaching. We also developed and tested the feasibility of a reciprocal peer surgical coaching program based on the data we acquired from both our local and international studies. However, I found that the definition of peer coaching in surgery has not been standardized and changes depending on the researcher. The term is used loosely in the literature. This creates confusion among surgeons and prospective participants. To my knowledge, there is no established definition of peer surgical coaching. Using our data and the definitions available in other fields of study, such as executive and sports coaching, I propose the following definition of peer surgical coaching.

By peer surgical coaching, we mean an autonomous, cyclic, confidential, and finite process in which a person enters a voluntary relationship with a guide, colleague, or friend who, using preestablished personalized goals, helps guide them in self-reflection, providing feedback, and working with feedforward to develop, improve, or master techniques, processes, skills, or knowledge. [64,65,68,86,98-102]

Because peer coaching is still relatively new to medicine, most health professionals still use mentoring interchangeably with coaching.[103] The proposed definition recognizes the key differences between coaching and mentoring and the importance of the coaching relationship.

One difference is that the coaching relationship is finite. It is based on working on a particular goal. Once it is reached, the relationship usually dissolves. On the contrary, a mentor-mentee relationship can be lifelong, and it is most likely acquired naturally.

Mentoring is not focused on specific goals but can be much broader and include both professional and personal advice. Another key difference is that the skills required to coach a peer are not innate; mentors may be required to take some courses for mentorship improvement, but becoming a coach requires knowledge of session development, effective goal setting, establishing rapport and trust, active listening, effective feedback, and planning.[104] Additionally, great coaches have a unique mindset that varies from teaching or mentorship and can be acquired through training

Although this definition was developed for peer surgical coaching, I believe it may translate to any medical specialty. Coaching for surgeons has proven effective for long-term change in practice,[68,99] but the lack of clarity may inhibit participation. Using a standardized definition will help establish a common language for all related parties and structure successful peer coaching programs.

6.1.2 Framework for Peer Surgical Coaching

The main purpose of this thesis was to develop a conceptual framework to help guide the design and development of future peer coaching programs. Our proposed framework adds to the previously published coaching framework.[70] We suggest scanning both of them when designing a peer coaching program. We have organized the concepts into three domains: *optimal program structure, benefits to participation, and barriers.*

It is crucial to design future coaching programs based on the intended specialists' *preferred characteristics* and particular needs. Decisions on the format of the coaching program should be based on the intended goals. However, surgeons should be allowed to choose, when available, between live intraoperative coaching or video review, either virtually or in person. Another essential component to the structure of a program is the timing of sessions. According to our data, surgeons are interested in longitudinal sessions and are more amenable to monthly interactions. However, this should also be consulted and personalized to the intended audience's needs and goals.

Training of both the coach and the coachee should be addressed in the design of the program. Training is essential because it allows participants to acquire or perfect skills, like active listening, paraphrasing, effective inquiry, establishing rapport, non-judgmental feedback, and strategic planning. Additionally, training provides participants with the opportunity to understand peer coaching and the coaching mindset. A surgical coach must first and foremost *understand* the definition of peer surgical coaching and differentiate it from teaching or mentoring. It is important to practice the coaching mindset in all the interactions. The coaching mindset includes, but is not limited to, understanding that the

coachee drives the agenda, the coach is only a guide or facilitator, and there is always room for improvement as a coach.

The program should include time to set goals. This should be done by the coach and the coachee before the beginning of the interactions. During this time, the coachee should be guided to examine specific areas for improvement. The first session can also help the coach establish trust and rapport. Particular qualities, such as humility and receptiveness, are necessary for both parties. Although they will likely vary among participants, awareness and conscious practice will help participants develop them.

An essential part of coaching is the growth and advancement of the coach, which improves with practice. Therefore, it is also essential that the program incorporate time to assess and provide feedback to the coach. Performance can be assessed with previously validated tools[86].

Ensuring participation *benefits* are clearly stated to the participants will probably garner more interest in coaching programs. Benefits range from professional aspects like enhancing patient safety, care evolution, and achieving expert performance to the personal growth linked to coaching.

Finally, programs need to consider the *barriers* that may be encountered in the process of designing or running a coaching program. Planning for them will ensure the design of the program is successful. Although these are not the only barriers to participation in a coaching program, they were the most discussed in our research. Thus, using the data from our studies I have created a conceptual model with some facilitators that may help resolve them.

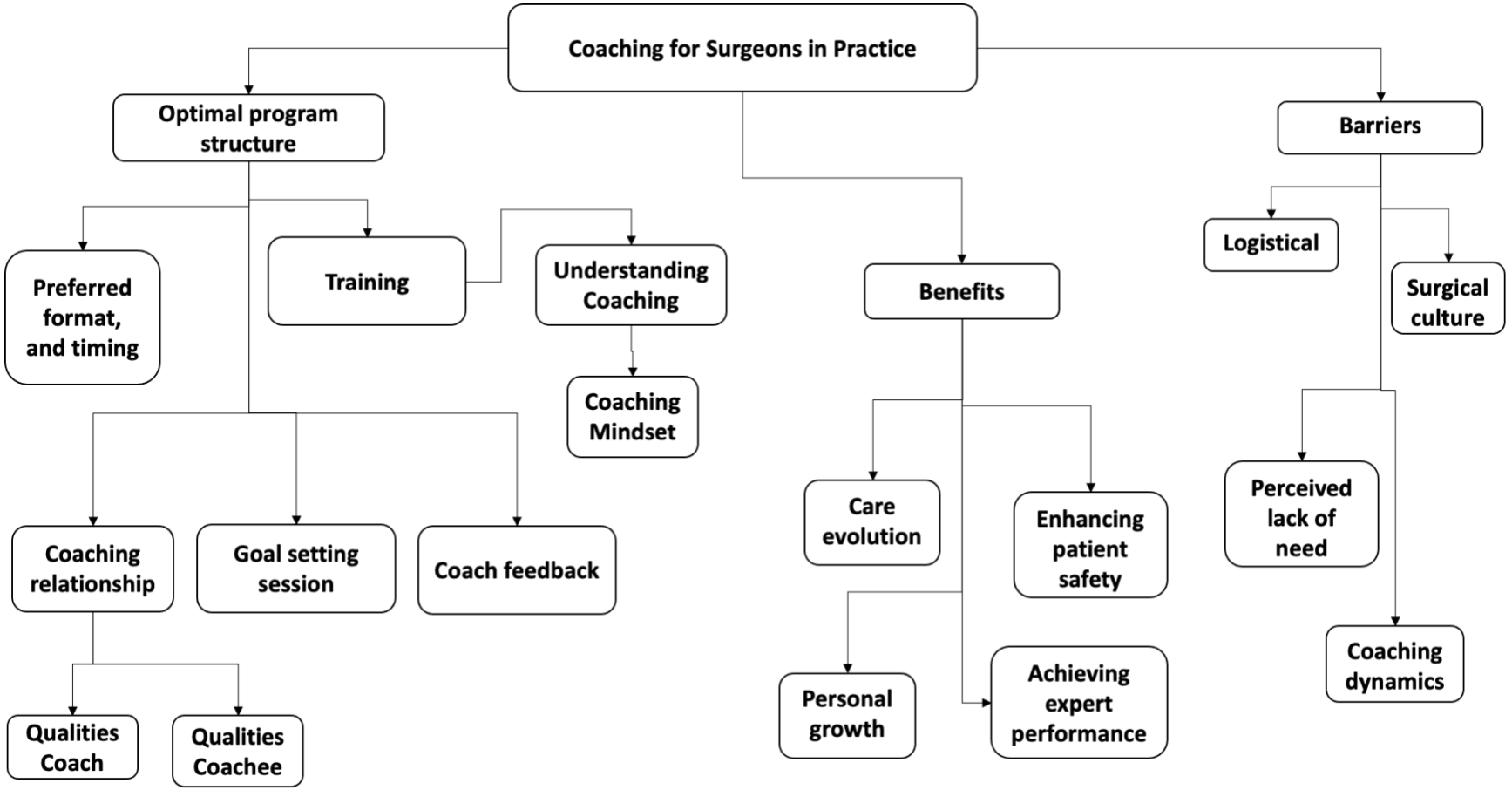

Fig. 6.1.2.1 Conceptual Framework

6.1.3 Conceptual Model: Facilitators and Barriers to Participation

Throughout this thesis, we described surgeons' desires, needs, motivations, and barriers to participating in a peer surgical coaching program. I believe that the needs and motivations expressed by practicing surgeons could also help solve the barriers encountered. Therefore, I will attempt to explain the relationship between the needs, motivations, and barriers to peer surgical coaching using this graphic conceptual model.

First, the graphic should be read from the center out, starting from the bottom and counterclockwise. Like a radar chart, each line corresponds to a different characteristic. The first group (yellow) represents the needs and motivations, while the last (brown) are the most common barriers encountered. Connecting lines with keys determine the way to each solution, and solutions may be related to one or more barriers.

The most commonly cited barriers are logistical barriers, including lack of time, geography, lack of cases or expertise, and credentialing issues. Solutions to this barriers include allowing surgeons to set their own goals and work in their preferred location. Aditionally providing CME credits may increase motivation for participation.

Surgical culture barriers, like the fear of being judged or deemed incompetent, may be solved by maintaining surgical autonomy in all aspects of the program. If surgeons' have the autonomy to choose the structure, coach, location, goals, and timing of the interactions, feelings of loss of control may be lessened; maintaining confidentiality and emphasizing that coaching is not punitive can increase the participants' security to participate. Finally, as described before, the coaching mindset is an essential element that

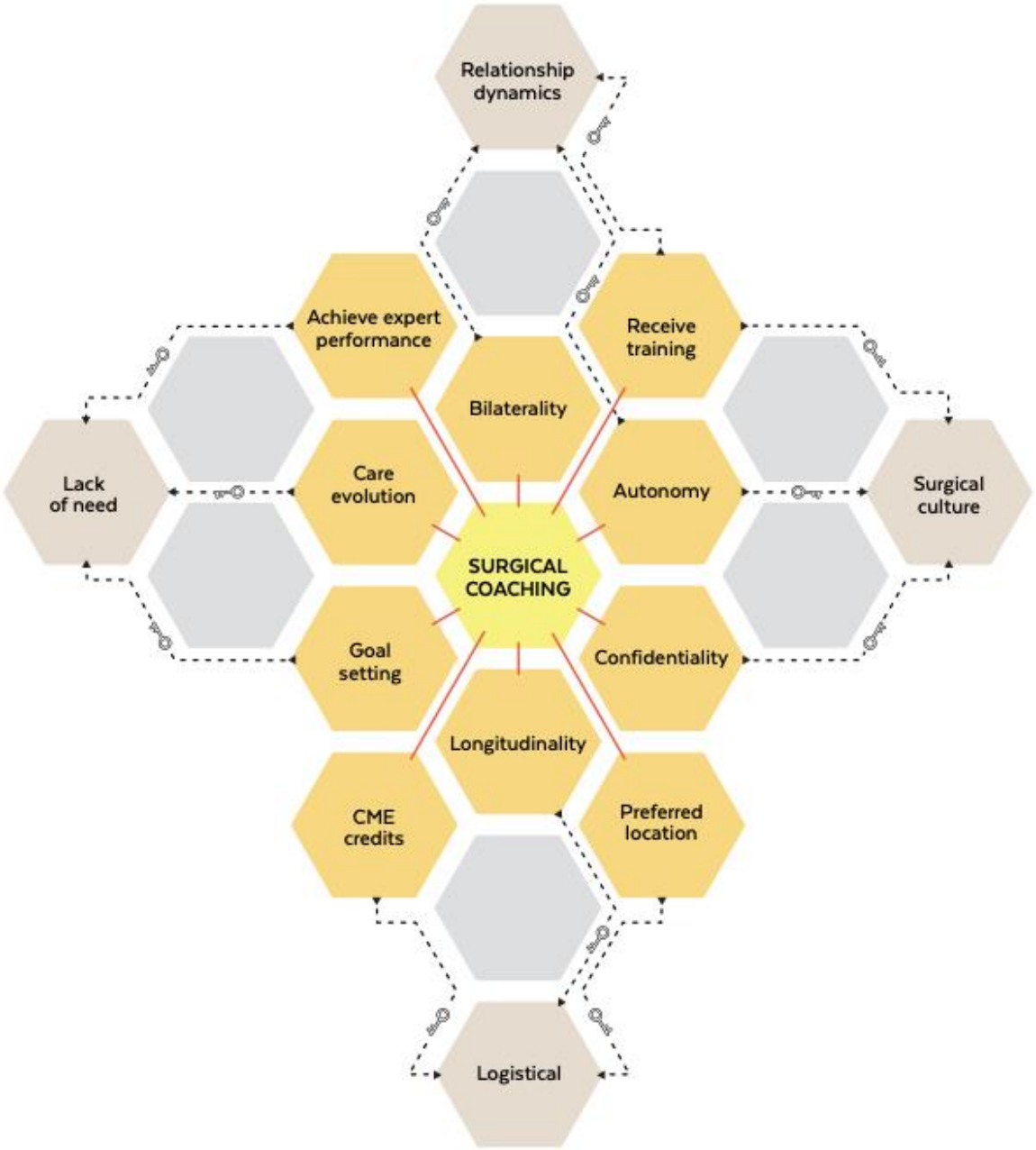

Fig. 6.1.3.1. Conceptual model

should be incorporated in all surgical programs and that may help unfold almost all barriers.

Relationship dynamics, like hierarchy and power issues, may be solved with bilaterality, meaning all surgeons could act as both the coach and coachee at any given time. Moreover, bilaterality can level up the playing field and may help avoid power dynamics. Additionally, training and understanding the coaching mindset may provide comfort and security for participation.

Finally, resolving perceived lack of need requires creativy, but setting goals may help. This way, surgeons' can work on a particular goal they may not be able to with any other modality. In addition, reminding surgeons that coaching is a positive experience, never to be seen as punitive, and that it allows for achievement of expert performance and care evolution can also help.

6.2 Limitations

In this section, I will describe several limitations that should be considered when reading and interpreting the data presented in this thesis.

In chapter 3, we conducted focus groups with a local cohort of surgeons. Most of the participants had either heard of each other, worked with each other, or trained together, all of which could have inhibited free-flowing conversation. Additionally, surgeons were invited to participate with an email explaining the research project. However, some participants may have joined to learn the implications of this research in the workplace, further inhibiting the flow of opinions. Furthermore, only participants in general surgery and its subspecialties were invited to participate, limiting generalizability and transferability. However, we resolved this by broadening the inclusion criteria to all American College of Surgeons accepted specialties for the rest of the research steps. Finally, only public information was used to send invitations, which may have restricted the number of surgeons reached.

In chapter 4, we built and distributed a survey meant to reach a greater number of surgeons. Although dissemination methods were varied, including social media, emails, and snowballing, most respondents hailed from North America. This could be due to the fact that the emails were sent to the primary researchers' networks, adding some bias to the results. Also, the variation in the number of respondents between continents impeded statistical analysis for comparison purposes. Additionally, the number of questions and time to fill the survey could have proven to be a barrier, as the answers seem to dwindle in the demographic section. Furthermore, the survey logic applied to each question allowed

participants to skip questions if they preferred, leading to differing denominators for questions. Finally, even though most questions had space to fill out opinions, the inherent limitations of surveys include lack of depth and inflexibility of answers, limiting important opinions.

In chapter 5, we developed a pilot study based on previously collected and published data. Although participant satisfaction was high, each pair was only expected to undertake two sessions. While we were looking for feedback about the structure and characteristics of the program, and two sessions could be enough as a proof of concept, more interactions could have increased the opinions and ideas of the participants. Additionally, the first cohort of participants had the training session 10 months before starting the program, and although there was a refresher training, some important aspects may have been lost. Also, the first cohort of participants had group training in person in a workshop format, while the second cohort had individual virtual training, adding to specific exercises not being done. Because of the current state in the medical environment, lack of time and cases could have increased for certain participants and caused the number of withdrawals. Finally, participants were recruited from the researchers' network and had previously heard of the project, which could be an added bias since they were probably already positively inclined towards coaching. Therefore, the recruitment of more surgeons with little or no awareness of the concept of peer coaching could make results generalizable.

6.3 Future directions

Several important questions have emerged from this research and should constitute future research in this area.

In chapter 3, we found that barriers to participation were one of the most discussed themes among participants. Even though surgical culture barriers were infrequently mentioned in our international survey (chapter 4), they are still essential to address. Logistical constraints are undoubtedly the most encountered barriers, but we believe they have the most straightforward solutions. However, surgical culture[87] has been reported as a limiting obstacle to growth among surgeons and necessitates the most attention. In my opinion, surgical culture barriers need more time to evolve, and the change should start with trainees. However, I still think we can address specific aspects of surgical culture barriers by answering a lingering research question. As previously mentioned, most of the surgical culture barriers revolve around loss of autonomy and the idea of being judged as incompetent. Thus, answering the questions: *"What do patients think about their surgeons being coached?"* and *"What do other team members think about the surgeon being coached?"* can play an essential role in the advancement of surgical coaching. Understanding patients' and other team members' opinions on surgical coaching and continuing professional development can help governing bodies create successful coaching requirements.

Additionally, in chapter 5, participants in our pilot study expressed a need and desire to receive training to become surgical coaches. Most of our participants believed that all surgeons willing to participate in a coaching program should be trained to become a coach

to avoid hierarchical issues. Participants also felt that coaching should be standardized to avail to CPD standards.

Becoming an executive coach can take years of training and experience. However, we are not expecting physicians to embark on years of training to become certified coaches. As discussed throughout this thesis, surgeons are not born with the skills needed in coaching and should acquire them through training. Since one of the barriers is time and adding a 2-day workshop to the surgeons' schedules would only add another barrier, the design and development of an asynchronous online course for practicing surgeons should be explored and piloted. Therefore, the second question to address in the future could be *"Is asynchronous training efficient for surgical coaching?"* If this is the case, training could be modeled after certain certification programs that are readily available in surgery, facilitating the use of coaching as a new CPD modality.

Interestingly, coaching in other fields improves not only professional but also personal aspects of the coachees' life. Similarly, there have been reports of negative personal side effects. However, because peer surgical coaching is still in its initial stages, we do not know the side effects of coaching at this level. Therefore, exploring *"What are the other benefits associated with coaching for surgical performance?"* or if they even exist could be appealing.

Finally, we focused on the needs and structure of programs for the majority of this thesis. However, one crucial question remains *"Does coaching improve surgical outcomes?"* To this day, there have been several articles stating change after coaching, and we determined there was a higher rate in change of clinical practice directly associated with

coaching in Chapter 2. However, only two studies have tried to associate surgical outcomes with coaching.[95,96] The first study could not determine a change in technical skills due to limitations on their analysis, but reported subjective improvement of surgeon well-being[95]. The second study, on the other hand, reported a reduction in operative times for coachees[96]. Given how time-consuming coaching is, research in this area is needed to justify the investment. Initial research could focus on basic everyday surgeries that can be assessed with the available tools (i.e., Objective Structured Assessment of Technical Skills). Surgeons that opt to participate could be asked to provide their clinical registry, including operative details and outcomes, to serve as preintervention data. The intervention would be structured based on the data collected for this thesis, and interventions would be longitudinal. Postintervention data would be collected for 6-12 months after coaching has ended to study the actual change in long-term clinical practice and surgical outcomes.

6.4 Conclusions

In conclusion, I have explored the use and interest of coaching among practicing surgeons. The rate of formal peer feedback amongst surgeons is low worldwide, but there is high interest and acceptance to participate in coaching programs that can change that. Autonomy preservation and trust between peers is essential for surgeon participation. Coaching programs for practicing surgeons may be the missing link for filling the gap in practice improvement. This thesis presents a conceptual model and framework that may be used to guide, develop, design, and structure future peer surgical coaching programs.

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APPENDICES

APPENDIX 1. SEARCH STRATEGY SYSTEMATIC REVIEW

Search strategy in Ovid Medline(R), Ovid Medline(R) in-process & other nonindexed citations, Ovid Medline(R) DailyaAnd Ovid Oldmedline(R) <1946 to Present>

1 Mentors/ (9507)

2Feedback/ (28324)

3 Formative Feedback/ (446)

4 (coach* or debrief* or de-brief* or deliberate-practice or mentor*).tw,kf. (27113)

5 ((feedback or feed-back) not ((haptic or kinesthetic) adj1 (feedback or feed-back))).tw,kf. (117700)

6 or/1-5 (159971)

7 exp Surgeons/ (4661)

8 exp Surgical Procedures, Operative/ (2847983)

9exp Surgical Specialties/ (186463)

10Bariatric Medicine/ (61)

11or/7-10 (2980164)

12ed.fs. (254361)

1311 and 12 (39780)

14((laparoscop* or surge* or surgic*) adj5 (skill* or training or educat* or teach* or learn*)).tw,kf. (29717)

1513 or 14 (58192)

16Education, Medical, Continuing/ (23612)

17clinical competence/ (81967)

18((acqui* or improv*) adj5 (performanc* or proficien* or skill*)).tw,kf. (94984)

19professional-development.tw,kf. (7693)

20(continu* adj5 educat*).tw,kf. (24499)

21(CME or CPD).tw,kf. (10022)

22or/16-21 (221411)

2315 and 22 (16242)

APPENDIX 2. FOCUS GROUP GUIDELINE FOR FACILITATORS

1. Physician gets a demographic questionnaire and consent form to sign before being given their pre-assigned table number.

2. At each table

a. Welcome:

"Welcome and thank you very much for joining us for this focus group about coaching in surgery"

b. Introduction:

"My name is XXXX and I am collaborating with a group of researchers from the Montreal General Hospital and McGill on a project about coaching in surgery. My role today is to ask questions and listen to your responses, but also to ensure that everyone has the opportunity to share their ideas. we really want to hear from everyone, so please understand that I may redirect conversations as they develop to ensure that everyone has a turn to speak. You will also notice that we have XXX and XXX taking notes of your responses"

c. Explain goals:

"As the invitation states, we have invited you here to learn about your opinion about surgical coaching as a means of continuing professional development. In an era of rapidly changing technology and surgical practices, understanding the needs of surgeons for refining techniques and learning new skills is of great importance"

d. Recording/confidentiality:

"We are audio-recording this session because we don't want to miss anything you say. This study may be published, however rest assured that your names will not be reported and that your comments will be kept confidential by our research team. So, please keep in mind that we want both negative and positive comments. Often the negative comments are the most useful. Also, please respect the confidentially of your fellow group members, what is discussed here should not leave the room. As you read in the consent form, you may

withdraw from the focus group at any moment but please be advised that the data collected up to that point cannot be erased."

e. Name tents:

"We each have a name tent in front of us. This is to help me learn your names, but it is also to encourage you to carry out conversations with each other. Feel free to agree or disagree or to further the thoughts of what you hear colleagues say. Do not fell that you have to respond directly to me; this is meant to be a group conversation, so please use the name tents to address the others in the table. This will also help us when we transcribe notes and recordings."

f. Food/Beverages

"Feel free to eat and drink while we talk"

g. "Is everyone comfortable to start now?"

h. To start the discussion:

(remember the longer they are quiet the longer it will take for them to start)

"I would like to do a quick tour-de-table. Please, say your first name and what you think when you hear the word coaching?"

"So now that we have all introduced ourselves, let's get started"

Questions:

1. Have you heard about coaching for surgeons?

-What do you think about it?

-Who do you think may benefit from it?

Tell them our definition of coaching:

"A process whereby an experienced and trusted role model, advisor, or friend, guides another individual in the development or self-reflection of ideas, learning and professional development, working with mutual goals, and providing support for changes in practice"

*** if by any chance mentorship comes up, and you have time, you can explain that mentorship and coaching are used interchangeably but that they are quite different,

mentorship includes all aspects of life, does not set individual goals, has no time limits, and is normally a vertical relationship (as in senior and junior relationship)" ***

2. Do you think there is a need for peer coaching to refine or learn new skills?

3. What do you think is the value (negative/positive) of adding this model to the current existing CME activities?

- cost
- access
- efficiency
- effectiveness

*** if at any point you reach a "it won't work, no value, etc." … you may use == humor me, imagine a world where you would need it, fill your cup of wine and let's keep talking == *** you may use humor and make it fun

4. What do you think about having someone coach you?

- How would you feel (positive/negative)?
- Would you prefer to choose who or have someone appointed?
- Would you prefer to be coached live or after the fact (review videos, discuss cases, etc)?
- Would you prefer an anonymous program (coaches and coaches are not identified to one another)?

5. What would prevent/deter you from participating in a coaching program?

- logistics (time, travel, licensure, lack of equipment
- no need
- fears/perceptions
- interpersonal

6. What do you think about being a coach to someone else?

- Challenges
- Dynamics
- Barriers

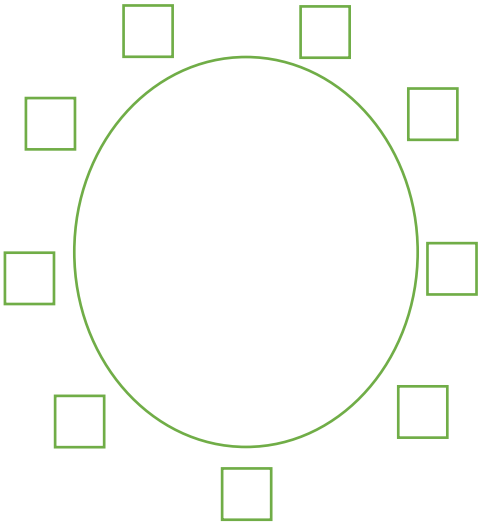
i. Summary and wrap up:

“Imagine in an ideal world where we have fixed the costs and logistics (add barriers that come up here), how do you think an ideal coaching program would function?”

“In order to ensure that what I’ve heard you say is as close as possible to what you really have said, I will summarize briefly what I’ve heard as the main themes of our conversation…. “

“I would like to do a final tour-de-table and hear what you think about the summary- is there anything you want to add to/disagree with/ or can you improve this summary?” (go in the opposite direction from the original tour-de-table)

FOR OBSERVERS (place map so you may take better notes)



APPENDIX 3. SURVEY

Thank you for participating in our survey. We want to let you know that all your answers are anonymous and strictly confidential.

The purpose of the survey is to determine how practice patterns and coaching needs of surgeons vary across different geographical regions, so we can analyze the feasibility and usefulness of peer coaching.
The outcomes of this survey are expected to inform the development of successful coaching initiatives as a new and adjunct modality for already established models of continuing professional development.

If you have any questions, or wish to be informed of the final results, please contact Dr. Sofia Valanci at sofia.valanci@mail.mcgill.ca

1. Have you heard about coaching for practicing surgeons as a continuous professional development modality?
Yes/No

2. Please indicate how often you use each of the following continuous professional development modalities (space is provided so you may add modalities)

	Daily	Weekly	Monthly	Annually	Never
Reading peer-reviewed journals					
Attending meetings/conferences					
Watching edited videos posted by other surgeons					
Reviewing my own videos independently					
Reviewing my own videos with a knowledgeable colleague					
Reviewing my surgical outcomes					
Participating in hands-on technical skills courses					

Observing or assisting other surgeons in the OR within my institution					
Other (please specify)					

3. Does your institution or health system require formalized skill or knowledge assessments to maintain operating privileges?
Yes/No

4. If yes, how often do these assessments occur?

Every case Weekly Monthly Annually Every 1-5 years Every 6-10 years

Other interval

5. During formalized assessments, which of the following modalities are used (check all that apply):
Standardized knowledge test
Standardized test of surgical skill in the OR (e.g., assessments according to a structured rating scale) OSATS Spanish reference
Standardized test of surgical skill with video recordings (e.g., assessments according to a structured rating scale) OSATS English reference
Standardized test of surgical skill in simulation (e.g., assessments according to a structured rating scale)
Continuous professional development credit system
Structured departmental or hospital performance reviews
Maintenance of certification in accredited programs (e.g. Advanced Trauma Life Support – ATLS)
Formalized review of surgical outcomes
Other (please specify)

6. Which of the following entities require these assessments (check all that apply):
Institution/hospital
Insurance company/payors
Professional licensing board
Governmental regulators
Other (please specify)

7. Can junior surgeons in your hospital operate alone?
Yes – they are expected to complete cases independently with some exceptions for particularly difficult or high acuity procedures
Yes – they complete parts of cases independently but a more senior surgeon is present for the critical steps of most procedures
No – they are generally supervised and guided by a more senior surgeon at all times

8. If junior surgeons are supervised by more senior colleagues, for how many years on average does this take place before they are completely autonomous?
1 year
2-5 years
6-10 years
>10 years

9. If junior surgeons are supervised by more senior colleagues (external to their surgical team), what variables are used to decide when they can perform a given procedure autonomously? (Check all that apply)
Formalized review of their outcomes
Formalized assessments of their surgical skills using validated metrics
Unstructured assessments of their outcomes
Unstructured assessments of their surgical skills
Time in practice
Case number
Supervisor/senior surgeon intuition
Arbitrary decision
Other (please specify)

10. In your regular practice, how often do you operate with another surgeon (not including residents/fellows?
Every case Most complex/Advanced cases Rarely Never

11.When you operate with another surgeon, how often do you provide feedback on his/her performance or techniques?
Every time Most of the time Occasionally Rarely Never

12.When you operate with another surgeon, how often do you receive feedback on your own performance or techniques?
Every time Most of the time Occasionally Rarely Never

13. How often do you seek informal (unstructured) feedback from another surgeon regarding your operative performance or techniques?
Daily Weekly Monthly Annually Never Only for certain cases

14.How often do you seek formal feedback from another surgeon regarding your performance or technique? (Formal feedback being structured, planned feedback according to pre-defined goals).
Daily Weekly Monthly Annually Never Only for certain cases

15. In your current practice environment, which of the following might prevent you from scrubbing with another surgeon for the purposes of learning or continuous improvement? (check all that apply)
Difficulties with scheduling and availability
Lack of expertise for what I would want to learn
Remuneration issues (e.g. the fee structure only supports one staff surgeon per case)
Credentialing issues – the appropriate person does not have privileges at my hospital or in my health system
Geographic distance – the appropriate person practices too far away
Low case volumes for what I'd want to focus on
There is no need – I engage in enough other learning opportunities already
There is no need - I learn from the residents/fellows
There is no need – I don't require feedback
Fear of losing control of the OR/case
Competition issues among colleagues
Risk of appearing unskilled/unqualified
Risk of encountering unwelcome or unpleasant feedback
I have no actual barrier
Other (please specify)

16. If someone were to give me feedback in the OR, I would prefer they worked at a different hospital than me
Agree Neither agree nor disagree Disagree

16. If someone were to give me feedback in the OR, I would prefer to know them personally
Agree Neither agree nor disagree Disagree

17. If someone were to give me feedback in the OR, I would prefer they be one of my mentors/teachers
Agree Neither agree nor disagree Disagree

18. If someone were to give me feedback in the OR, I would prefer they be a younger surgeon with new skills
Agree Neither agree nor disagree Disagree

19. If someone were to give me feedback in the OR, I would prefer to have knowledge of their surgical skills and reputation
Agree Neither agree nor disagree Disagree

20. If someone were to give me feedback in the OR, I would prefer they were a complete stranger to me
Agree Neither agree nor disagree Disagree

21. If someone were to give me feedback in the OR, I would prefer they were a friend
Agree Neither agree nor disagree Disagree

For the purposes of the following questions, "**coaching**" will be defined as "a process whereby an experienced and trusted role model, advisor, or friend guides another individual in the development or self-reflection of ideas, learning and professional development, working with mutual goals, and providing support for changes in practice." (Valanci-Aroesty, etal. Implementation and Effectiveness of Coaching for Surgeons in Practice–A Mixed Studies Systematic Review. Journal of Surgical Education. 2020 Feb 10.)

22.If a voluntary peer coaching program to allow participants to learn or refine surgical skills was instituted in your hospital, would you participate?
Yes No Maybe

23. How often could you see yourself engaging in a one-two hour peer coaching session as the coachee given your current commitments?
Daily Weekly Monthly Annually One time only

24. Which of the following methods would you prefer (check all that apply):
Live coaching in the operating room
Review of videos of surgical cases
Simulation-based coaching

Other (please specify):

25. Which of the following elements would you want to see included in such a program:
Check all that apply
Being allowed to set your own specific goals
Being allowed to choose your coach
Having personal meetings with the coach to discuss your goals
Allowing the coach to define some or all of the goals
Being allowed to set the frequency and length of the interactions yourself
Having the frequency and length of the interactions predefined
Receiving CME credits for participation
Receiving formalized feedback for your own personal use
Receiving formalized feedback for review by your department chair
Receiving formalized evaluations you can use for promotions/advancement/job applications, etc.
Being able to provide feedback to the coach
Being able to change coaches if conflicts arise
Other (please specify):

26. What would be the ideal length of such a program?
One-time interaction
Scheduled number of interactions
Ad hoc scheduling according to your needs

27. If you were invited to serve as a coach for another surgeon, would you participate?
Yes No Maybe

28. How often could you see yourself engaging in a one-two hour peer coaching session as the coachee given your current commitments?
Daily Weekly Monthly Annually One time only
29. For which of the following reasons would you participate in a peer coaching program (as coach, coachee or both)?
Learn new techniques
Network with other surgeons
Refine existing techniques
Career advancement/promotion
Confirmation of surgical skill/proficiency
Option to travel to other sites/centers

Improve patient safety
CME credit
Improve operative outcomes
Increase collegiality among colleagues
Financial remuneration/incentive
Enjoyment
Other

30. How do you feel coaching compares to other modalities of continuing professional education (conferences, reading a journal, watching videos, etc.? Check all that apply

Coaching is:	More	Less	Equal to
Expensive			
Convenient (time, geography)			
Fun			
Patient centered			
Hands on			

General information

What is your gender?
Female Male Other Prefer not to say

In which specialty did you complete residency training?
General Surgery
Urology
Oncology
Cardiac surgery
colorectal
Plastic Surgery
Vascular Surgery
Other (Please specify)

Where did you complete residency?
Country and city

Did you complete a fellowship?
Yes, please specify the field

No

Where did you complete fellowship training?
Country and city

What is your current practice environment? (choose all that apply)
Community practice (private)
Community practice (public)
University-affiliated
Full-time academic
Other (please specify):

Where do you currently practice surgery?

Country or City

How many years have you been in practice post residency/fellowship?
0-5 years 6-15 years 16-25 years >25 years

Thank you. We appreciate the time you have taken to fill out the survey

APPENDIX 4. SURVEY DATA PRESENTED BY COUNTRY AND YEARS IN PRACTICE

Appendix 4.1. Comparison between North American and Non-North American participants

	Desire to participate				Location			Number of sessions			Timing				
	Yes	Yes coach	No	No coach	OR	Video	Sim	One	Scheduled	Adhoc	Monthly	Daily	Weekly	Annually	One time only
Noth America (263)	83%	84%	3%	2%	83%	59%	33%	4%	52%	41%	40%	1%	13%	21%	3%
Rest of World (159)	87%	84%	2%	1%	84%	65%	35%	5%	58%	35%	52%	2%	32%	12%	2%

Appendix 4.2. Program format preferences by Continent and Years in practice.

Years in Practice	Continent	Prefered Location of Coaching Interactions					
		OR		Video		Simulation	
0-5	North America (53)	52	98%	37	70%	19	36%
	South America (6)	4	67%	6	100%	0	0%
	Oceania (1)	1	100%	1	100%	0	0%
	Europe (9)	6	67%	8	89%	5	56%
	Asia (34)	30	88%	25	74%	12	35%
	Africa (4)	4	100%	3	75%	2	50%
6-15.	North America (71)	58	82%	39	55%	24	34%
	South America (5)	5	100%	5	100%	1	20%
	Oceania (3)	1	33%	2	67%	0	0%
	Europe (5)	5	100%	3	60%	2	40%
	Asia (18)	14	78%	12	67%	8	44%
	Africa (4)	4	100%	1	25%	0	0%
15-25	North America (61)	47	77%	36	59%	15	25%
	South America (3)	3	100%	1	33%	0	0%
	Oceania (0)	0	0%	0	0%	0	0%
	Europe (12)	10	83%	6	50%	1	8%
	Asia (19)	16	84%	13	68%	8	42%
	Africa (4)	4	100%	3	75%	2	50%
>25	North America (78)	62	78%	43	54%	29	37%
	South America (7)	5	71%	3	43%	3	43%
	Oceania (2)	2	100%	0	0%	0	0%
	Europe (8)	7	88%	4	50%	4	50%
	Asia (10)	8	80%	6	60%	5	50%
	Africa (5)	4	80%	2	40%	3	60%
NA	NA (99)	8	8%	4	4%	0	0%
Total		**360**	**85%**	**263**	**62%**	**143**	**34%**

Years in Practice	Continent	Preferred Scheduling of Coaching Interactions					
		One time		Scheduled according to goals		Ad hoc	
0-5	North America (53)	1	2%	33	62%	19	36%
	South America (6)	0	0%	2	33%	4	67%
	Oceania (1)	0	0%	1	100%	0	0%
	Europe (9)	1	11%	7	78%	1	11%
	Asia (34)	3	9%	21	62%	9	26%
	Africa (4)	0	0%	4	100%	0	0%
6-15.	North America (71)	3	4%	42	59%	24	34%
	South America (5)	1	20%	2	40%	2	40%
	Oceania (3)	0	0%	1	33%	2	67%
	Europe (5)	0	0%	4	80%	1	20%
	Asia (18)	0	0%	10	56%	7	39%
	Africa (4)	0	0%	1	25%	3	75%
15-25	North America (61)	2	3%	29	48%	27	44%
	South America (3)	0	0%	1	33%	2	67%
	Oceania (0)	0	0%	0	0%	0	0%
	Europe (12)	1	8%	6	50%	5	42%
	Asia (19)	0	0%	13	68%	6	32%
	Africa (4)	0	0%	1	25%	3	75%
>25	North America (78)	5	6%	32	41%	38	48%
	South America (7)	0	0%	4	57%	2	29%
	Oceania (2)	0	0%	0	0%	2	100%
	Europe (8)	1	13%	4	50%	3	38%
	Asia (10)	0	0%	7	70%	3	30%
	Africa (5)	1	20%	3	60%	1	20%
NA	NA (99)	3	3%	4	4%	3	3%
Total		**22**	**5%**	**232**	**55%**	**167**	**39%**

Years in Practice	Continent	Preferred Frequency of Coaching Interactions									
		Daily		Weekly		Monthly		Annually		One time only	
0-5	North America (53)	1	2%	3	6%	20	38%	8	15%	1	2%
	South America (6)	0	0%	1	17%	5	83%	0	0%	0	0%
	Oceania (1)	0	0%	0	0%	1	100%	0	0%	0	0%
	Europe (9)	0	0%	2	22%	5	56%	1	11%	0	0%
	Asia (34)	1	3%	12	35%	17	50%	3	9%	1	3%
	Africa (4)	0	0%	4	100%	0	0%	0	0%	0	0%
6-15.	North America (71)	0	0%	7	10%	26	37%	16	23%	3	4%
	South America (5)	0	0%	2	40%	3	60%	0	0%	0	0%
	Oceania (3)	0	0%	0	0%	0	0%	3	100%	0	0%
	Europe (5)	0	0%	2	40%	2	40%	0	0%	0	0%
	Asia (18)	0	0%	3	17%	12	67%	2	11%	1	6%
	Africa (4)	0	0%	1	25%	2	50%	1	25%	0	0%
15-25	North America (61)	1	2%	7	11%	24	39%	19	31%	2	3%
	South America (3)	0	0%	2	67%	1	33%	0	0%	0	0%
	Oceania (0)	0	0%	0	0%	0	0%	0	0%	0	0%
	Europe (12)	1	8%	4	33%	4	33%	3	25%	0	0%
	Asia (19)	0	0%	5	26%	14	74%	0	0%	0	0%
	Africa (4)	0	0%	1	25%	2	50%	1	25%	0	0%
>25	North America (78)	1	1%	17	22%	35	44%	11	14%	2	3%
	South America (7)	0	0%	3	43%	3	43%	1	14%	0	0%
	Oceania (2)	0	0%	1	50%	1	50%	0	0%	0	0%
	Europe (8)	0	0%	2	25%	5	63%	1	13%	0	0%
	Asia (10)	0	0%	2	20%	5	50%	3	30%	0	0%
	Africa (5)	0	0%	4	80%	0	0%	0	0%	1	20%
NA	NA (99)	1	1%	1	1%	6	6%	2	2%	0	0%
Total		**6**	**1%**	**86**	**20%**	**193**	**46%**	**75**	**18%**	**11**	**3%**

Appendix 4.3. Barriers to coaching by Continent and Years in Practice

Years in Practice	Continent	Perceived Barriers to Coaching Participation							
		Logistics		Surgical Culture		Perceived Lack ofNneed		No Perceived Barriers	
0-5	North America (53)	45	85%	15	28%	0	0%	5	9%
	South America (6)	6	100%	5	83%	0	0%	1	17%
	Oceania (1)	1	100%	1	100%	0	0%	0	0%
	Europe (9)	8	89%	2	22%	2	22%	3	33%
	Asia (34)	20	59%	13	38%	1	3%	9	26%
	Africa (4)	2	50%	3	75%	0	0%	1	25%
6-15.	North America (71)	60	85%	17	24%	7	10%	11	15%
	South America (5)	5	100%	2	40%	0	0%	1	20%
	Oceania (3)	3	100%	0	0%	2	67%	1	33%
	Europe (5)	3	60%	1	20%	1	20%	2	40%
	Asia (18)	14	78%	4	22%	2	11%	2	11%
	Africa (4)	3	75%	1	25%	1	25%	1	25%
15-25	North America (61)	51	84%	9	15%	3	5%	13	21%
	South America (3)	3	100%	1	33%	0	0%	1	33%
	Oceania (0)	0	0%	0	0%	0	0%	0	0%
	Europe (12)	10	83%	0	0%	1	8%	3	25%
	Asia (19)	12	63%	6	32%	1	5%	6	32%
	Africa (4)	3	75%	0	0%	0	0%	1	25%
>25	North America (78)	59	75%	12	15%	13	16%	24	30%
	South America (7)	6	86%	2	29%	2	29%	1	14%
	Oceania (2)	0	0%	0	0%	0	0%	2	100%
	Europe (8)	7	88%	0	0%	1	13%	1	13%
	Asia (10)	8	80%	0	0%	2	20%	0	0%
	Africa (5)	5	100%	1	20%	0	0%	2	40%
Total		**334**	**79%**	**95**	**22%**	**39**	**9%**	**91**	**22%**

APPENDIX 5. PRE-INTERVENTION QUESTIONNAIRE

1. How would you describe the need for a reciprocal peer-coaching program for practicing surgeons? (CPD = continuous professional development)

No need	Small need **(n=1)**	Modest need **(n=1)**	Above average need **(n= 8)**	Great need **(n=5)**
This program fills no CPD gap and would not be useful	Almost all benefit of such program could be achieved through other CPD activities (eg. Courses, meetings, etc)	Such a program would be a useful adjunct to other CPD activities	There are some gaps in practice refinement opportunities for practicing surgeons which such a program would help address	There are major gaps in practice refinement opportunities for practicing surgeons which such a program would address

2. How do you predict this learning activity will compare to the following traditional CPD activities?

   A) Attending a lecture by an expert in the field

Vastly inferior	Inferior	Neutral **(n=5)**	Superior **(n=4)**	Vastly superior **(n=6)**

   B) Watching an edited surgical video independently

Vastly inferior	Inferior	Neutral **(n=4)**	Superior **(n=9)**	Vastly superior **(n=2)**

C) Attending a post graduate course including a hands-on component

Vastly inferior	Inferior	Neutral **(n=12)**	Superior **(n=3)**	Vastly superior

D) Reading peer reviewed literature

Vastly inferior	Inferior	Neutral **(n=4)**	Superior **(n=5)**	Vastly superior **(n=6)**

3. How appealing do you personally find the idea of a reciprocal peer coaching program regarding your own practice refinement and continuing professional development?

Not at all appealing	Mildly appealing **(n=1)**	Modestly appealing **(n=2)**	Very appealing **(n=8)**	Extremely appealing **(n=4)**
Nothing about such a program entices me	I can see some merits to such a program but overall would probably not participate outside of this study	I can see some problems in implementing such a program, but overall would like to participate	While such a program would require a cultural change with respect to CPD for practicing surgeons, I would welcome this change	I would welcome such a program and eagerly participate

4. What are your motivations for participating in this program (circle all that apply)?

Find another CPD modality **(n=6)**
Acquire a new skill **(n=8)**
Convenience
Enhance my current skills **(n=13)**
For enjoyment **(n=3)**
Improvement of patient care **(n=9)**
Relevance to practice **(n=3)**
Other:

5. How easily do you think a reciprocal peer coaching program for practicing surgeon would be adopted by the surgical community?

Impossible	Difficult **(n=4)**	Challenging **(n=9)**	Fairly easy **(n=2)**	Very Easy
The cultural changes needed to implement such a program will never happen	This would require a major change in typical surgeon behavior which will not come without a struggle	While there are some hurdles to overcome, the need for such a program would outweigh any resistance in the end	While there may be some skeptics, most surgeons would welcome such a program if it were available	I can foresee very few issues with implementing such a program

6. How would you score the universal applicability of a reciprocal peer coaching program for practicing surgeons (applicability of the peer coaching model to diverse surgical environments/specialties/etc)?

Extremely unlikely	Unlikely **(n=1)**	Neutral **(n=9)**	Likely **(n=4)**	Extremely likely
This is a very niche model that would only work under very narrow conditions	Such a program should be adapted to various settings and conditions and I would anticipate encountering many challenges	Such a program would be reasonably well adapted to various settings and conditions with some foreseeable challenges	Such a program would be easily adapted to various settings and conditions with few foreseeable challenges	Such a program could easily work under any conditions (regardless of practice patterns, location, academic or community setting, etc.)

7. How do you think a reciprocal peer coaching program for practicing surgeons would affect interpersonal relationships among surgical colleagues?

Very badly	Badly	Neutral	Good **(n=8)**	Excellent **(n=7)**
It would cause nothing but fights and damage interpersonal relationships	Ultimately the damage to interpersonal relationships would be greater than the benefits	Relationships will be equally damaged and improved with no net gains or losses	There might be some small conflicts but ultimately such a program would improve interpersonal relationships	Personal relationships would be greatly improved by such a program

8. How do you **feel** knowing someone will be observing your videos and giving you feedback? (Circle all that apply)

Excited **(n=5)**
Happy **(n=3)**
Optimistic **(n=10)**
Hopeful **(n=4)**
Nervous **(n=4)**
Anxious **(n=3)**
Skeptical **(n=1)**
Fearful **(n=2)**
Angry
Ambivalent **(n=1)**
Other

9. How do you think your participation in a peer-coaching program will be seen by the rest of the surgical team (trainees, nurses, anesthesiologists, etc)?

Very badly	Badly	Neutral **(n=5)**	Good **(n=7)**	Excellent **(n=3)**
I fear the team will think I am incompetent	I think the team will think my skills are weak	I think the team will not care	I think the team will generally view my	I think the team will proud of me for being

for volunteering to participate	for volunteering to participate	one way or the other	participation positively	open to feedback

10. Do you think the following barriers to participation will be encountered during this study? If yes, please explain how you plan to overcome them

Barrier	**YES**	**NO**	**Solution**
Lack of time	9		
Lack of cases	6		
Scheduling conflicts	12		
Geographical barriers (different sites)	6		
Boredom	2		
Poor goal setting	3		
Partner incompatibility	1		
Other:	1		Hierarchy, money, environment

11. How important was being able to choose your own partner to you in deciding to participate in this program?

Not important	Slightly important	Moderately important	Very important **(n=12)**	Extremely important **(n=3)**
Actually, I really wish my partner had been chosen for me	I would have preferred my partner was chosen for me	It does not matter to me either way	Choosing my own partner was a benefit of the program	I doubt I would have participated if I had had no

			but not mandatory	choice in my partner

12. How do you anticipate participation in this program will impact your **surgical practice**?

No impact **(n=1)**	A slight impact **(n=1)**	Somewhat of an impact **(n=3)**	Moderate impact **(n=7)**	Great impact **(n=3)**
I expect participation in this program will not impact my practice whatsoever	I doubt participating in this program will meaningfully impact my practice, but I might learn one or two new useful things	I anticipate learning a few new things which I might incorporate into my surgical practice	I anticipate learning several new things which I look forward to incorporating into my surgical practice	I anticipate learning a great deal and expect my surgical practice to change greatly as a direct result

13. How likely are you presently to ask your study partner for advice or feedback regarding your surgical practice?

Never **(n=1)**	Rarely **(n=1)**	Sometimes **(n=2)**	Often **(n=8)**	Routinely **(n=3)**
I have never and probably would never ask him/her for advice or feedback; we do	I might ask him/her for advice or feedback but only if I were really stuck	I sometimes ask him/her for advice and feedback; I know he/she would be there	I often ask him/her for advice and feedback; it's not a routine occurrence but	I routinely ask him/her for advice and feedback; we have a very open collegial

not discuss our surgical practice		if I needed it, but I usually approach others first	he/she is one of my go to people when I need it	relationship and he/she helps me a great deal

14. How useful did you find the goal setting exercise in focusing your personal objectives for this program?

Useless	Almost useless	Neutral **(n=4)**	Helpful **(n=2)**	Very helpful **(n=9)**

15. How would you rate the Orientation Workshop? (with the coach, January 2020)

	Very bad	Bad	Neutral	Good	Excellent
Content			3	6	5
Facilitator			2	7	5
Time commitment			3	8	4
Usefulness			3	6	5

APPENDIX 6. COACH/COACHEE LOG

Reciprocal Peer Coaching for Practicing Surgeons (Coach)

Please complete the survey below
Thank you!
Coach mindset and project Schedule (attachment)

Date of session
What were the goals for this session?
Did the COACHEE reach their goal(s)?
What was the coachee struggling with that prevented them from achieving their goal(s) before this session?
According to you, what does the COACHEE think they should improve?
What concrete steps did you take to provide feedback to reach the COACHEEs goal(s)?
What steps do YOU think the COACHEE should take to reach their goal(s)?
Did you feel that the COACHEE experienced any learning barriers (fears, anxiety, fixed mindset, etc.) that impeded their progress? Yes/No
Please explain
How did you feel during your role as a COACH (anxious, calm, happy, bored, etc.)? Please tell us why you felt this way.
Based on coachee feedback, is there something you could improve? Yes/No
Please explain
What do you think you did well as a coach?
What do you think you could improve as a coach?
What was the most meaningful thing you learned/gained? (Please be as specific as possible, i.e., skills, non-technical skills, communication, etc.)
What else did you learn/gain during this session that you would like to comment on? (Please be as specific as possible, i.e., skills, non-technical skills, communication, etc.)
Do you have something else to comment on?

Reciprocal Peer Coaching for Practicing Surgeons (Coachee)

Please complete the survey below
Thank you!
Coach mindset and project Schedule (attachment)

Date of session
Why did you choose your partner? (Please be as specific and descriptive as possible, i.e., friend, expert, non-judgmental, etc.) If you did not choose your partner but got chosen by someone, what would you look for if you looked for a coach?
What were the goals for this session?
Did you reach your goal(s)? Yes/No
Why? (Please provide as much detail as possible, i.e., work in progress, reestablishment of goals, etc.)
What was the most meaningful thing you learned/gained? (Please be as specific as possible, i.e., skills, non-technical skills, communication, etc.)
What else did you learn/gain during this session that you would like to comment on? (Please be as specific as possible, i.e., skills, non-technical skills, communication, etc.)
What do you think your coach did well during this session?
What do you think your coach could do to improve their coaching?
What do you think you did well as a coachee?
What could you do to improve as a coachee?
Do you have something else to comment on?

APPENDIX 7. POST-INTERVENTION QUESTIONNAIRE

1. After your experience how would you describe the need for a reciprocal peer-coaching program for practicing surgeons?

No need	Small need	Modest need **(n=1)**	Above average need **(n=2)**	Great need **(n=6)**
This program fills no CPD gap and would not be useful	Almost all benefit of such program could be achieved through other CPD activities (e.g., Courses, meetings, etc.)	Such a program would be a useful adjunct to other CPD activities	There are some gaps in practice refinement opportunities for practicing surgeons which such a program would help address	There is a major gap in practice refinement opportunities for practicing surgeons which such a program would address

2. How did this learning activity compare to the following traditional CPD activities?

A) Attending a lecture by an expert in the field

Vastly inferior	Inferior	Neutral **(n=4)**	Superior **(n=1)**	Vastly superior **(n=4)**

B) Watching an edited surgical video by yourself

Vastly inferior	Inferior	Neutral **(n=2)**	Superior **(n=3)**	Vastly superior **(n=4)**

C) Attending a post graduate course including a hands-on component

Vastly inferior	Inferior	Neutral **(n=5)**	Superior **(n=4)**	Vastly superior

D) Reading peer reviewed literature

Vastly inferior	Inferior	Neutral **(n=2)**	Superior **(n=1)**	Vastly superior **(n=6)**

3. After your experience how easily do you think a reciprocal peer coaching program for practicing surgeon is going to be implemented?

Impossible	Difficult	Challenging **(n=5)**	Fairly easy **(n=4)**	Very easy
The cultural changes needed to implement such a program will never happen	This would require a major change in typical surgeon behavior which will not come without a struggle	While there are some hurdles to overcome the need for such a program would outweigh any resistance in the end	While there may be some skeptics most surgeons would welcome such a program if it were available	I can foresee very few issues with implementing such a program

4. After your experience how has your relationship among surgical colleagues and your study partner been affected?

Very badly	Badly	Neutral **(n=2)**	Good **(n=1)**	Excellent **(n=6)**
My interpersonal relationships have been damaged beyond repair	The damage to interpersonal relationships was greater than the benefits	There was no change to my interpersonal relationships	We had some conflicts, but we could manage and a program like this can improve relationships in the workplace	My interpersonal relationships were improved after participating in this program

5. How did you **feel** while having your partner observe your video and give you feedback?

Excited **(5)**
Happy **(3)**
Optimistic **(6)**
Hopeful **(5)**
Nervous **(3)**
Anxious **(1)**
Skeptical **(3)**
Fearful
Angry **(1)**
Ambivalent
Other:

7. Do you feel having a first session to establish goals and talk to your partner helped ease your feelings? Why?

Yes **(6)** No **(2)**

8. Did these feelings change when you were the one coaching and not getting coached? How?
Yes **(3)** No **(6)**

9. Do you think a program like this could be reproducible?

Extremely unlikely	Unlikely	Neutral **(n=5)**	Likely **(n=3)**	Extremely likely **(n=1)**
This is a very niche model that would only work under very narrow conditions	Such a program could be adapted to various settings and conditions with difficulty	Such a program would be reasonably well adapted to various settings and conditions with some foreseeable challenges	Such a program would be easily adapted to various settings and conditions with few foreseeable challenges	Such a program could easily work under any conditions (Regardless of practice patterns, location, academic or community setting, etc.)

10. How did participation in this program impact your surgical practice?

No impact	A slight impact **(n=1)**	Somewhat of an impact **(n=3)**	Moderate impact **(n=3)**	Great impact **(n=2)**
Participation in this program did not impact my practice whatsoever	Participating in this program did not meaningful impact my practice but I did learn one or two new useful things	I learned a few new things through participating in this program which I might incorporate into my practice	I learned several new things through participating in this program which I look forward to incorporating into my surgical practice	I learned a great deal through participating in this program and expect my surgical practice to improve greatly as a direct result

11. After participating in this program, how likely are you to ask your study partner for advice or feedback in your surgical practice in the future?

Never	Rarely	Sometimes	Often **(n=3)**	Always **(n=6)**
I would still never ask him/her for advice or feedback	I might ask him/her for advice or feedback but only if I were really stuck	I might occasionally ask him/her for advice and feedback but would still approach others first	I would sometimes ask him/her for advice and feedback; he/she would be one of my go to people when I need it	I will routinely ask him/her for advice and feedback; I feel there are a valuable resource

12. What is your overall satisfaction with this reciprocal peer coaching pilot program?

Not at all satisfied	Slightly satisfied	Moderately satisfied **(n=1)**	Very satisfied **(n=2)**	Extremely satisfied **(n=6)**
Thank you for inviting me to participate but I found it to be a waste of time	I am mildly satisfied with this program but do not believe I will participate again in the future	I am honestly satisfied with this program and may or may not participate again in the future	I am quite satisfied with this program and probably will participate again in the future	I am highly satisfied with this program and will definitely participate again in the future

13. According to previous research some barriers to peer coaching are logistical (like time, geography, availability, insurance and privileges), do you think this virtual reciprocal peer coaching program eliminates those barriers?

Yes **(6)**	No **(3)**

14. If this kind of program was to become another CPD modality, what would be your motivations for participating? (check all that apply)

Convenience **(2)**
For enjoyment **(2)**
To enhance my current skills **(7)**
Improvement of patient care **(5)**
Relevance to practice **(6)**
Cost compared to other CPD modalities **(2)**
Acquire a new skill **(7)**

Other:

15. Were the following barriers encountered during this study? If yes, please explain how you managed them

Barrier	**YES**	**NO**	**How did you manage them**
Lack of time	**5**		
Lack of cases	**2**		
Scheduling conflicts	**2**		
Geographical barriers (different sites)	**2**		
Boredom			
Poor goal setting			
Partner incompatibility			
Fear of being judged	**2**		
Fear of losing control of my case	**1**		
Other:			

16. Were your expectations met? Why?

Yes **(9)**	No

17. Did you find the experience valuable? Why?

Yes **(9)**	No

18. Did you enjoy being a coach/coachee? Why?

Yes **(8)**	No **(1)**

19. Would you participate in more initiatives like these? Why?

Yes **(9)**	No

APPENDIX 8. EXIT SURVEY

1. What were your reasons for participating in this program?

- I was invited to participate
- I was asked to be a partner
- I was curious
- I believe coaching is useful and I am interested in it
- Other (please specify)

2. What were the barriers you encountered when trying to participate in this program?

- I did not have time
- COVID-19
- Lack of cases (not COVID-19 related)
- It was not what I expected
- I had problems with my partner
- I could not find anything I needed to learn
- I did not like the format
- No barrier
- Other (please specify)

3. If you could participate in a program that was accredited by a college, would you do so? Why?

- Yes
- No
- Maybe

4. What would you want to see incorporated in a program for you to participate?

- CME credits
- Remuneration
- Formal coach training
- Ongoing training
- Preestablished goals
- An established structure that has to be followed
- Autonomy to choose partner, goals, and structure
- Ability to be both the coach and coachee
- I would only participate if I were the coach
- Opportunity to interact with surgeons in other geographical areas
- Other (please specify)

5. Besides this program have you ever been invited or participated in a coaching program after graduation

Yes No

If yes, can you tell us the structure and goals?

APPENDIX 9. POST-INTERVENTION SEMI-STRUCTURED INTERVIEW GUIDE

First, we would like to thank you for your participation in this program. The research team is interested in learning about your experience and getting feedback to improve a future program to better meet the needs of surgeons. We welcome any type of feedback, constructive or critical. We need to learn both what works and what does not to make sure we get it better for next time.

This session is being recorded, so that we may capture and code all your feedback. It will not be made available to anyone but me.

Do you have any questions before we begin?

1. You have participated as both a coachee and a coach, correct?
2. Could you please take a moment to reflect on the program and describe your overall experience as a coachee? What did you find positive or not so positive?
3. Could you now do the same thing on your experience as a coach?
4. Why did you decide to participate in the program?
5. What were you hoping to gain from the program?
6. How do you feel you benefited?
7. Did it meet your expectations?
8. Would you do it again? Why or why not?
9. Would you recommend participation to another surgeon? Why or why not?
10. Did you feel adequately prepared to be a coach? How would you have changed that? Is there something else you would have liked to be aware of?
11. Did you feel actively engaged? Or did you feel like a student?
12. What can the program do to improve the interactions? More training? Of what kind? Should we train coachee? Do you think choosing your partner was beneficial? More structure? (Probe)
13. Did you use the tools that were provided for you?
14. What more training, support, or resources do you think are needed?
15. What do you think are the benefits of coaching? The drawbacks? Do you think it would work as a new CPD modality?
16. What made it easier for you to participate? What would make it much better?
17. What did you struggle with as a coachee and a coach?
18. Do you have any general feedback? What didn't you like, what didn't I ask that is important for you to let us know?