Fellows as Role Models (FaRMs): Perceptions of Influence Among Pediatric Residents and Pediatric Subspecialty Fellows at a Single Institution

Thesis

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Abstract

Role modeling is a key instructional medium in medical education, with effects on both the role model and the observer. Most studies to date focus only on the attending physician as the role model and the medical student or resident as the observer. The impact of role modeling demonstrated by fellows, observed by residents is not currently known. This exploratory descriptive-relational cross-sectional study attempted to answer several questions about the influence fellow role modeling may have on residents.

Pediatric residents and pediatric subspecialty fellows at this large freestanding Midwestern children's hospital believe that fellow role modeling influenced the residents' professional development and wellbeing. Beliefs about the scope and magnitude of this influence varied between and within groups, with residents reporting a greater degree of influence by fellows than the fellows themselves perceived in some key areas. The data suggests that fellows may often be aware of their position as role models, but are not fully aware of the impact their attitudes and actions may have on resident's professional development. This exploratory study lays the groundwork for further investigation into this important topic.

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Tyrrell LJ, Rose G, Shukri A, Kahwash S. Morphologic Changes in Red Blood Cells: An Illustrated Review of Clinically Important Light Microscopy Findings. *MJ Path*. 2021;43(2):219-239.

Fields of Study

Major Field: Educational Studies, Biomedical Education

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Chapter 1. Introduction

Overview

For the purpose of this thesis, a role model is defined as someone whose behaviors and/or attitudes are observed and emulated by others. Role modeling has long been considered an important part of medical education, but the phenomenon has largely only been studied in the context of medical students' and residents' observations of attending physicians. Studies about role modeling in the context of residents' observations of subspecialty fellows, who typically have more contact with these junior trainees than attending physicians, are largely absent from the literature. Subspecialty fellows are explicitly expected to function as role models despite having no formalized instruction on how to do so and no objective way to assess their role modelling skills. In order to find ways to assess and improve role modeling consciousness and skills among subspecialty fellows, the phenomenon of fellows as role models must first be further explored.

This chapter will first present background information on the medical education system in the United States, the concept of role modeling, and the significance of different types of role modeling within the medical field. The problem statement at the center of this thesis project will then be discussed and a theoretical framework will be introduced. A brief overview of the study's research questions, study design / methodology, limitations, and significance will follow.

Definitions of Terms

Table 1.1 Definitions of Terms and Abbreviations

ABP	The American Board of Pediatrics
ACGME	The Accreditation Council for Graduate Medical Education
Attending Physician	A physician who has completed residency training (+/- fellowship) and is able to practice medicine without overt supervision
Burnout	A syndrome caused chronic workplace stress that has not been successfully managed, which results in reduced professional efficacy, decreased engagement, and energy depletion for affected individuals[1]
CoP	Community of Practice: A persistent, sustaining social network of individuals who share and develop an overlapping knowledge base, set of beliefs, values, history and experiences focused on a common practice and/or mutual enterprise[2,3]
Fellow	Trainee in the fellowship phase of post-graduate training
GME	Graduate medical education; residency and fellowship
Mentor	An individual that intentionally and explicitly advises and guides a less experienced individual in a specific context
Milestones	Narrative descriptors that mark a level of performance for a given subcompetency along a developmental continuum[4]
PGY-1	Medical resident in their 1st year of post-graduate training; also referred to as an intern
PGY-2	Medical resident in their 2nd year of post-graduate training
PGY-3	Medical resident in their 3rd year of post-graduate training
PGY-4	Medical resident or fellow in their 4th year of post-graduate training
PGY-5	Medical resident or fellow in their 5th year of post-graduate training
PGY-6	Medical fellow in their 6th year of post-graduate training
PGY-7	Medical fellow in their 7th year of post-graduate training
PIF	Professional identity formation: The complex developmental process by which a person comes to think, act, and feel like a physician[5]
Post-Graduate Training	Professional medical training completed after graduation from medical school
Professional Development	The process whereby one identifies goals and learns / refines skills to promote and sustain their growth and success within their profession
Resident	Trainee in the residency phase of post-graduate training
Role Model	A person who demonstrates a standard to be imitated[6]; A person whose behaviors and/or attitudes are observed and emulated by others
Role Model Consciousness	Active awareness of one's position / function as a role model

SCT	Social Cognitive Theory
Subcompetency	Specific assessable areas of within a competency domain[4]
Subspecialty	An area of medical specialization, such as cardiology
Trainee	Medical student, resident, or fellow
UME	Undergraduate medical education; medical school
URiM	Underrepresented in medicine; those racial and ethnic populations or other historically marginalized people groups that are underrepresented in the medical profession relative to their numbers in the general population[7]

Background

Structure of U.S. Medical Education System

Becoming a physician is a complicated and time-consuming process composed of several distinct stages. Medical school is considered undergraduate medical education (UME) and is followed by some kind of graduate medical education (GME). GME in the United States, which includes both residency and fellowship training, is the on-the-job training phase of the medical education process and typically occurs within specific training programs at teaching hospitals throughout the country.

All medical students must complete residency training in order to become board-eligible physicians in their chosen field. For example, the training process for physicians specializing in pediatric medicine typically includes a 3-year pediatric residency training program followed by either a career in general pediatric primary care or by subspecialty fellowship training (Fig 1.1). Of note: medical school graduates could alternatively choose to complete a four-year internal medicine-pediatrics residency instead of a categorical pediatrics residency and would become board-eligible in both specialties. There are approximately 11,000 pediatric residents and 4,300 pediatric subspecialty fellows total in U.S. training programs at any given time.[8,9]

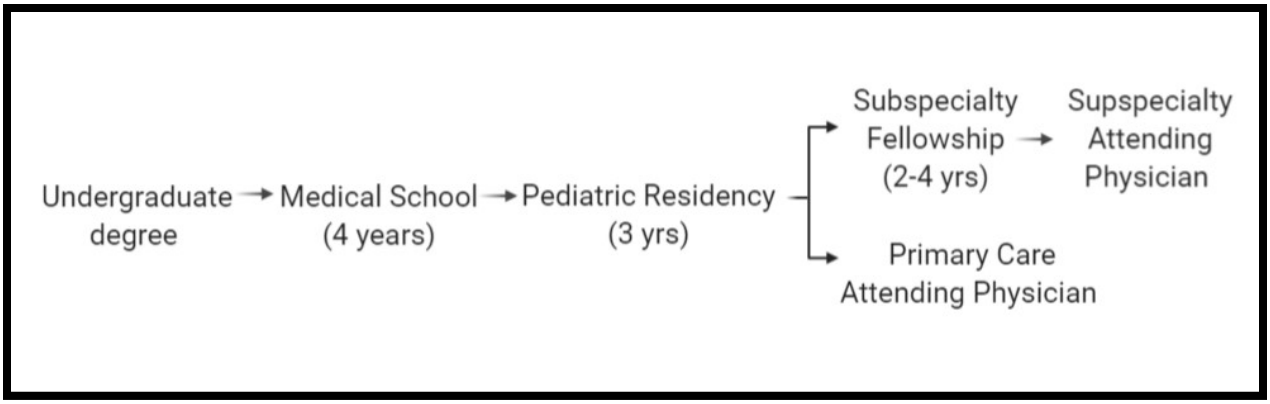

Figure 1.1 Training Process for Pediatricians

Graduate Medical Education as Apprenticeship

In many ways, the GME phase of physician training is analogous to a cooperative apprenticeship that blends traditional apprenticeship and cognitive apprenticeship methods.[10,11] Novices advance their proficiency, identity, and understanding in a professional field through participation with more experienced members within the respective community of practice, with the distinct aim of developing competence and eventual independent practice.[3,12] There is a transfer of observable skills, as well as a "hidden curriculum" as the more experienced "senior professionals" serve as role models for everything from technical skill to professionalism to professional identity (PIF).[10,13,14]

A role model is commonly defined as a person who demonstrates a standard to be imitated.[6] Successful apprenticeship requires that the learner first observe role modeling and then later demonstrate (model) that observed skill proficiently.[15] As supported by the cognitive apprenticeship model,[11] situated learning theory,[16,17] social learning theory,[18] the provisional selves adaptation framework,[19] and a modified theory of planned behavior,[20] the role model function of this more experienced professional is absolutely crucial to on-the-job education. One important but often overlooked aspect of role modeling in workforce education (including

medical education) is that learning from role modeling can occur without the role model's awareness and can be an active or a passive learning process on behalf of the observer.[21-23] It should also be noted that the standard demonstrated by the role model that is then imitated by an observer does not necessarily have to be a positive or desirable standard. Like any apprenticeship-based education, the key importance of role modeling in on-the-job education is true in medical education as well.

Role Modeling in Medical Education: History and Importance

While the significance of role models is described across many fields, their function within the medical education realm is particularly well-documented. Role modeling has been used to teach humanism, professionalism, and clinical skills in medical education throughout history.[24] Trainees frequently acknowledge the importance of role models in their education, affecting everything from career specialty choice to how they learn and perceive professionalism.[22,25,26] Exposure to both positive and negative role modeling can have long-lasting and profound effects on trainees, who are particularly impressionable during the early stages of their professional identity formation.[27,28]

Medical educators recognize the importance of role models as well, as they continuously cite role modeling as the means by which the vast majority of clinical and professionalism education occurs.[29,30] Role modeling is understood to be important at all stages of a medical professional's training and career, but there is a higher degree of role model influence for trainees as they begin to further refine their clinical skills, practice habits, and professional identities.

The importance of role models is not restricted only to what people can learn from observing role models. Acting as a role model to others is also an important aspect of professionalism and PIF, as demonstrated in various reports of faculty development interventions.[31-36] It has also been suggested that one of the ways faculty can support trainee PIF is by recognizing the value of peer role models in graduate medical education.[29]

There are no published studies that specifically investigate fellows as role models but, there are several that discuss residents as role models for interns and medical students.[37-39] One can reasonably assume that role model designation continues as resident trainees advance into fellowship, but the area deserves further study since the fellow is more advanced in clinical and professional training and thereby may be more prepared to be an effective near-peer role model.

Areas of Resident Development Influenced by Role Models

There are many studies that describe what characteristics effective, positive role models demonstrate. By the very definition of role model, i.e., one who demonstrates a standard to be emulated, these are thought to be some of the same categories in which residents are most readily influenced by role models. These categories include personal qualities, clinical competence, and teaching skills.[38,40-42] Additionally, it is well-documented that observing and participating in role modeling is a critical way in which residents learn professionalism, humanism, and communication skills.[13,14,28,31,43,44] Studies have also shown that attending physician role models have an impact on medical student and resident career choices.[25,42] Based on the literature, it has been either demonstrated or reasonably assumed that there are at least a dozen areas of residents' professional development influenced to by their observations of attending physician role modeling. These areas are summarized in Table 1.2.

Table 1.2 Twelve Areas of Potential Influence via Role Modeling

1. Medical decision-making / Clinical reasoning
2. Procedural or clinical exam skills
3. Communication / interaction with patients and their families
4. Communication / interaction with non-physician healthcare workers
5. Communication / interaction with other physicians
6. Communication / interaction with medical students
7. Reflective practices
8. Empathy towards patients / families
9. Handling difficult situations
10. Career goals / choice of subspecialty
11.Teaching methods
12. Leadership style

Role Modeling Expectations for Fellows

Fellows are clearly expected to function as role models for residents and others in certain contexts. This expectation is outlined in the Accreditation Council for Graduate Medical Education (ACGME) Milestones, a set of specialty-specific achievement goals used to assess graduate medical education (GME) trainees.[45,46]

The Accreditation Council for Graduate Medical Education (ACGME) established six universal core competencies to serve as the framework for trainee assessment across all specialties.[4] Each competency is divided into specific assessable subcompetencies. These subcompetencies are operationalized via Milestone scores. Milestones are narrative descriptors that mark a level of performance for a given subcompetency along a developmental continuum. Milestone content can vary between specialties and subspecialties, but there is often overlap.

In the *ACGME Milestones Guidebook for Residents and Fellows*, the 5-point rating scale is explained as a "stepwise progression towards mastery" with Level 1 describing a novice and Level 5 describing, "aspirational performance for a resident or fellow who is acting as a role

model or coach for others".[47] Therefore, role modeling each competency for others is arguably seen as the ultimate goal, though not necessarily the expected goal by graduation. However, there are specific milestones that do have contextual role modeling as a graduation-level target. Pediatric subspecialties, for example, have four different milestones that specifically mention role modeling by fellows, including the "Provide appropriate role modeling" subcompetency shown in Table 1.3.[46] There are additional milestones that assess competencies understood to be characteristic of effective role models as well.

Table 1.3 ACGME Pediatric Subspecialty Role Modeling Subcompetency and Associated Milestones

PC4. Provide Appropriate Role Modeling				
Level 1	Level 2	Level 3	Level 4	Level 5
Performs routine duties and behaviors of profession without awareness of the impact on those around them. May or may not reflect on actions as they occur and does not share reflections with others.	Inconsistently aware of the impact of one's behaviors and attitudes on others; sometimes teaches by example; occasionally will reflect openly on events as they occur and privately on events that have already taken place	Conscious of being a role model during many interactions; frequently teaches by example and often reflects in action openly in the presence of learners; behavior change implies frequent private reflection on action	Conscious of being a role model during most interactions; routinely teaches by example; regularly reflects in action and frequently reflects on action, sharing this analysis of practice with learners	Role modeling is a habit; recognizes that he or she is a role model in all actions and behaviors at all times; teaches by example; routinely reflects both in action and on action; examines, analyzes, and explains actions in the presence of learners and colleagues

Despite these explicit role modeling expectations for fellows, there is no literature describing ways to teach or enhance role modeling skills among fellows. If any formal curricula or intentional instruction exists, it is likely only at the individual program level and is not published in the literature. There are also no validated tools to specifically assess role model consciousness or role modeling behaviors among fellows, though ACGME milestone-based questions relevant to both are included in broader assessment tools.

Theoretical Framework

The concept of role modeling is subtly complex and must be understood within a broader milieu to fully understand within the context of graduate medical education. At its core, the role modeling paradigm is best understood through frameworks rooted in social cognitive theory (SCT). In short, the crux of SCT is that learning occurs via observation and imitation of others. SCT also includes concepts of vicarious punishment and vicarious reinforcement, whereby an observer not only learns via observing positive role modeling but also learns what not to do by witnessing the consequences of incorrect behaviors or attitudes.[18,41] The process of observational learning in SCT is dynamic and occurs within an environment where the learner and environment affect one another.[29] SCT will be explored in greater depth in Chapter two of this thesis.

The role modeling process, as understood through social cognitive theory, takes place within a larger conceptual paradigm known as "community of practice".[2] These two frameworks are complementary toward one another, as they are both rooted in the concept of learning and development as a social process. A community of practice (CoP) is a persistent, sustaining social network of individuals who share and develop an overlapping knowledge base, set of beliefs, values, history and experiences focused on a common practice and/or mutual enterprise.[2,3] A CoP must possess at least three elements: domain (a common interest or mission), community (mutual engagement of members to further the domain), and practice (knowledge, tools, and skills shared by the specific professional community).[48] A novice member of the CoP progresses from legitimate peripheral participation to full participation through a complex series of social

interactions within the CoP, and observing and emulating role models is an important component of that socialization process, as delineated in Figure 1.2 below.[5]

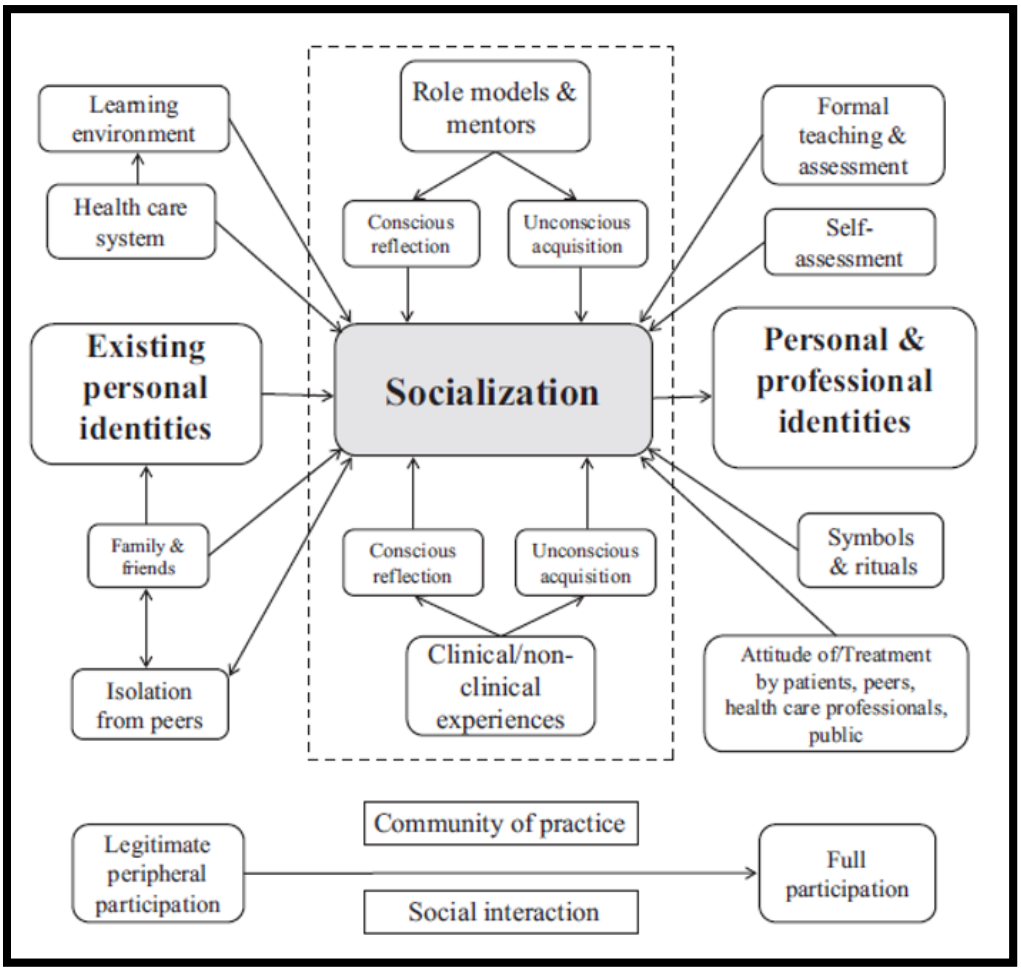

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Figure 1.2 Socialization Within a Community of Practice

Epstein et al. proposed a theoretical framework, informed by social cognitive theory, about the process of role modeling specifically within the medical education context.[23] Wiese, et al posited a more comprehensive theoretical framework of supervised workplace learning in postgraduate training that also emphasized the educational and developmental function of role modeling for both the observer and the role model.[49] Based on information provided by this

framework, Epstein's theoretical framework was modified as shown in Figure 1.3. This modified framework serves as the foundation of this thesis project.

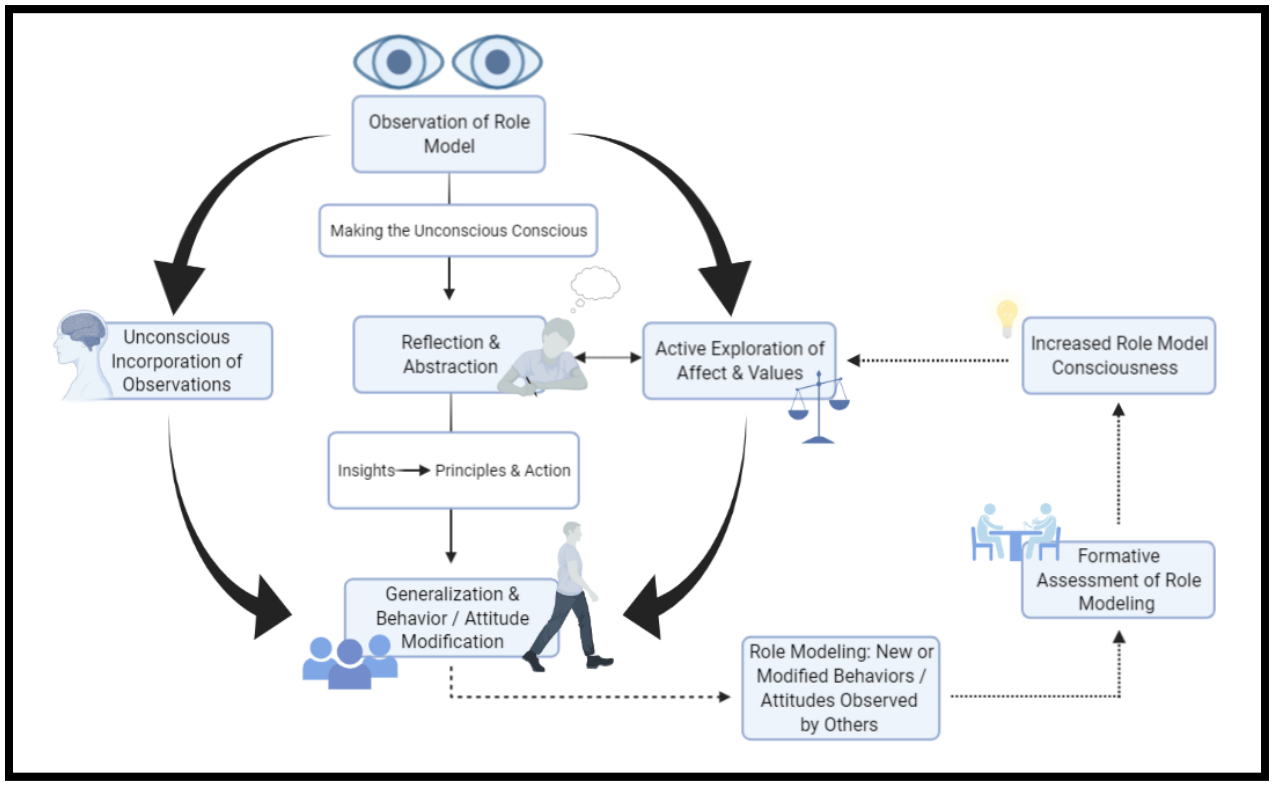


Figure 1.3 The Role Modeling Cycle in Medical Education

Problem Statement

Observing and participating in role modeling behavior is a critical part of resident and fellow education and professional development. Areas of development known to be influenced by role modeling are well-documented in the literature, as have characteristics of effective, positive role models. It has been shown that role model consciousness enhances efficacy. Pediatric subspecialty fellows are expected to function as role models despite a lack of data regarding fellow role modeling and its impact on both residents as observers and fellows as role models. Other than the existence of ACGME milestones, there is no systematic effort to assess or

improve the role model consciousness or behaviors of pediatric subspecialty fellows. In order to maximize the utility of role modeling as a tool for education and professional development during GME training, the phenomenon of near-peer role modeling as it relates to fellows and residents must be further explored.

Study Purpose

The primary purpose of this study was to discover and compare what pediatric residents and pediatric subspecialty fellows believe about the impact of fellow role modeling on pediatric residents' skills acquisition, career goals, and wellness at a large freestanding children's hospital in the Unites States. A secondary aim was to determine whether theory fits practice in this context, such as assessing whether fellow role modeling does indeed impact residents and exploring characteristics associated with role model consciousness. This study was designed to both provide data about this specific institution's population and to serve as a pilot study on which larger and more generalizable studies could be based.

Research Questions

As exploratory descriptive-relational cross-sectional research, this study seeks to answer the following questions:

1. What do residents believe about how they are influenced by fellow role modeling?

    1A. What relationships exist between resident characteristics and beliefs about the influence of fellow role modeling?

2. What do fellows believe about how their role modeling influences residents?

    2A. What relationships exist between fellow characteristics and beliefs about the influence of fellow role modeling?

2B. What relationships exist between fellow characteristics and role model consciousness?

3. What similarities and differences exist between resident and fellow beliefs about the influence of fellow role modeling on residents?

Methodology Overview

Using information gathered from published studies, input from medical education experts, and feedback from trainee interviews, a 24-question resident survey and a 26-question fellow survey were developed. The surveys were comprised mostly of 5-point Likert-like scale items, that asked questions about the influence of fellow role modeling on residents. All non-surgical pediatric residents and fellows at the institution were invited to complete the electronically-delivered survey that asked questions about the influence of fellow role modeling on residents. Ultimately, 78% of fellows and 78% of residents completed the survey during the two-week response period in the Fall of 2021. The data was analyzed first using descriptive statistics. Then aggregate data for residents and fellows were compared using nonparametric tests. Correlational analyses were also used to assess the relationships between different variables, such as reported role model consciousness and PGY level of training.

Significance

There is limited data about how (or even if) fellows function as role models or how that role modeling impacts other GME trainees. Despite clear expectations from ACGME that fellows exhibit appropriate role modeling behaviors and demonstrate role model consciousness, there is no formal training about role modeling for either residents or fellows at the study institution. This study will deepen the understanding of near-peer role modeling in graduate

medical education at this institution. This study will also lay the groundwork for future, more generalizable studies that may lead to better trainee role model assessment and evidence-based educational interventions to improve role modeling amongst fellows.

Assumptions

This study makes several assumptions. First, this study assumes that participants answered survey questions honestly and thoughtfully. Second, this study assumes that participants possessed enough self-awareness to respond to survey questions in a meaningful way. Third, this study assumes that all resident participants have had some exposure to fellows and thus have had the chance to observe fellows' actions and attitudes. Similarly, this study assumes that all fellow participants have had some exposure to residents during their fellowship.

Limitations and Delimitations

The primary limitation of this study is that it was conducted at a single institution, thus limiting its generalizability. The other main limitation is the study design itself. Because this is a quantitative study, there is no qualitative data to enrich or explain the participants' survey responses. Also, as a survey-based study, the data is self-reported, as opposed to objective data gathered by an outside observer. Thus, it may overlook or underestimate unconscious patterning, which is a term that refers to knowledge, skills, and attitudes unconsciously learned from observing role models. Lastly, the participants completed the survey in October of 2021, meaning the PGY-1 residents and the first-year fellows had only been in their respective roles for 3 months, which may have limited their exposure to one another while in those roles and thus affected their answers. The study was designed to collect data at a single point in time. Surgery residents and fellows were excluded from the study because of potential, though underexplored,

differences in the role modeling paradigm that exists in a highly-procedural learning environment.

Organization of the Thesis

This thesis will center on a research study conducted by the author exploring the topic of near-peer role modeling in graduate medical education. This thesis will first provide context on the long history of role modeling within medical education. Relevant literature on the various aspects of the phenomenon of role modeling will then be summarized and discussed. The study purpose, research questions, and study methodology will then be described. Study results and discussion of results will follow. This thesis will culminate with conclusions drawn from the study and postulations for future directions of this research.

Chapter 2. Literature Review

Introduction

Literature on role modeling within medical education is largely descriptive, though correlational, experimental, and grounded theory research studies about role modeling are becoming more commonplace. This chapter will first discuss the literature supporting the theoretical framework used for this thesis. Then, an in-depth literature review about various aspects of role modeling within medical education will follow. This chapter will end with a discussion of the gaps in the literature and a brief summary of the prominent findings from the literature review.

Theoretical Framework

How Medical Trainees Learn from Role Models

There are several publications that discuss how people choose role models; the vast majority reference the model as an individual complete entity.[6,50] Others have proposed that learners choose only specific characteristics of different role models to emulate.[21,51] The choice of which person or behavior to emulate may not always be intentional or conscious, as role modeling is frequently reported to be part of the implicit or informal "hidden" curriculum.[13,23,28,30,39,52] Data from a qualitative grounded theory study of non-medical professionals suggested that, "individuals tend to construe their role models as a selection process of attributes from others throughout their career".[15]

In another extensive qualitative study of professional socialization, groups of psychiatry residents, internal medicine residents, and biochemistry graduate students were followed longitudinally. The trainees in the study reported trying to emulate different attributes and skills demonstrated by a variety of role models rather than trying to emulate an individual role model in all respects.[21] Like most studies of role modeling, the authors framed the role modeling process as incredibly complex but unlike other studies, the authors attempted to identify factors that affected which characteristics trainees chose to emulate.

Foundational Frameworks

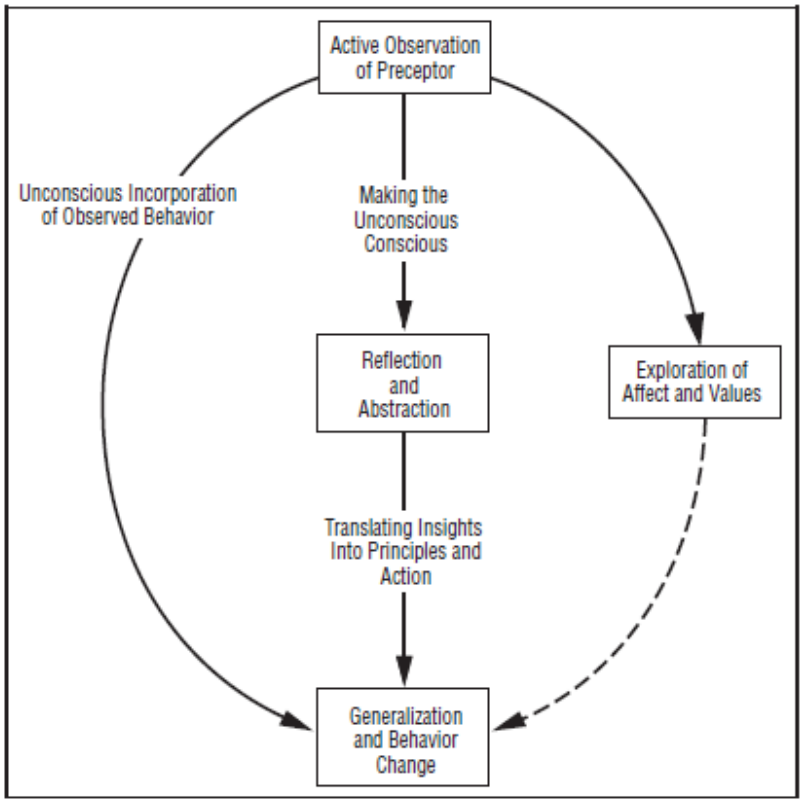
With all of this inherent complexity, it is no surprise that many different frameworks have been used in role modeling research. As discussed in the first chapter, the function of a role model in medical education is highlighted by several different frameworks including the cognitive apprenticeship model,[11] situated learning theory,[16,17] social learning theory,[18,53] the provisional selves adaptation framework,[19] and a modified theory of planned behavior.[20] However, for the purposes of this thesis project, a social cognitive theory-based framework as contextualized within the community of practice paradigm is the most fitting framework on which to base an understanding of the near-peer role modeling process that occurs within GME.

Social cognitive theory (SCT) includes the concepts of observational learning and triadic reciprocity.[29] Observational learning occurs when a learner witnesses a behavior or attitude modeled (intentionally or otherwise) by someone else. The learner then processes that observation through a series of cognitive methods which are influenced by the environment and by factors inherent to the learner. Then, if deemed appropriate by the learner (consciously or

subconsciously), the learner emulates the observed behavior.[18,54] Triadic reciprocity is the concept that a learner's behavior influences and is influenced by the learner and the environment.

In SCT, role models function primarily to serve cues to learners, vicariously reinforce restraints, and demonstrate new patterns of behavior that the learner can then emulate.[18,29] Thus, SCT is a fitting framework on which to base a study about role modeling. Another reason a SCT-based theoretical framework is particularly fitting for this near-peer role modeling study is that SCT involves the concept of role model relatability and learner self-efficacy. The knowledge, skills, and attitudes modeled by a peer or near-peer may potentially be viewed as more achievable (and thus worth emulating) because of the proximity of their station.[18] Many conceptual and theoretical frameworks have subsequently been informed by and/or supported SCT, some of which are specific to medical education. Four such frameworks – the active observation in clinical education framework, programme theory, the hidden process framework, and the observation / reflection / reinforcement framework – add to the understanding of the phenomenon of role modeling in medical education.

After conducting a qualitative study exploring how medical students learned from their community-based preceptors, Epstein et al. proposed a theoretical framework, informed by SCT, about the process of active observation and role modeling specifically within the medical education context.[23] Figure 2.1 represents the major components of Epstein's framework which serves as the basis of the modified framework used in this thesis.



Active observation in clinical medical education.

Reproduced with permission from Epstein et al[23]

Figure 2.1 Theoretical Framework of Active Observation in Medical Education

Programme Theory was proposed as a more comprehensive theoretical framework specifically for the supervised workplace learning that occurs within GME. As can be seen in Figure 2.2, this framework emphasizes the educational and developmental function of role modeling for both the observer and the role model.[49]

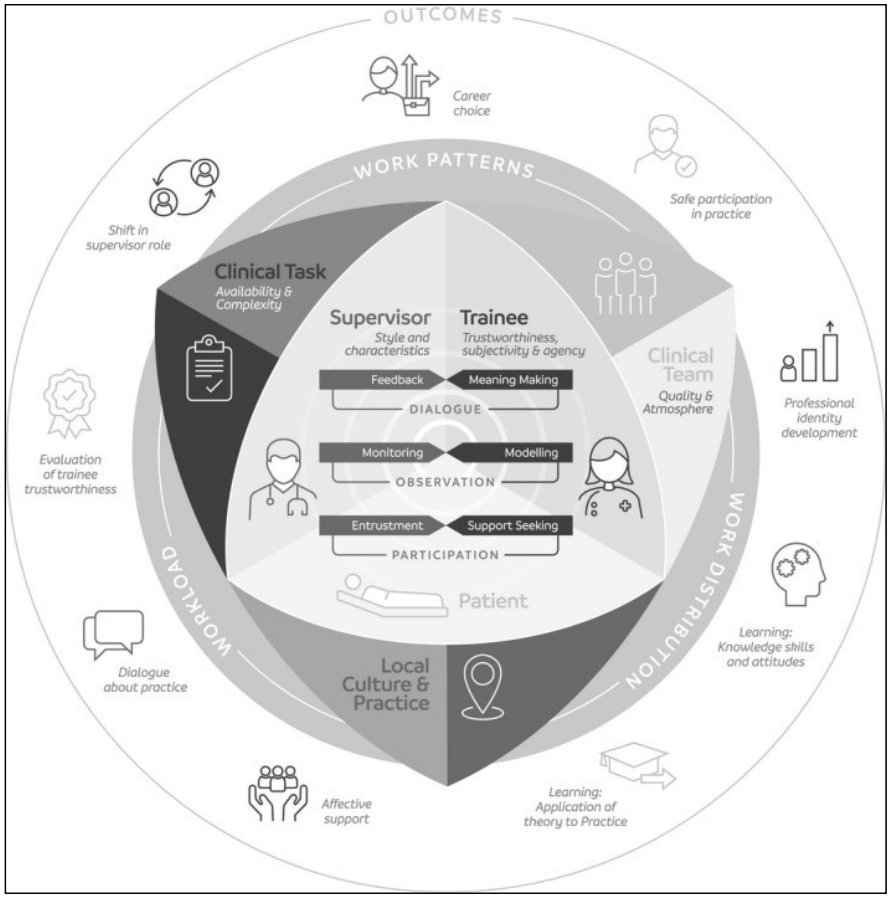


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Figure 2.2 Programme Theory

Grounded theory research conducted by Passi et al. generated a complementary conceptual framework about the hidden process of positive doctor role modeling. Their research underscored both the conscious and unconscious components involved in the role modeling process.[42] The authors described an "exposure phase", whereby the role model demonstrates a behavior, and a multi-step "evolution phase" during which the learner observes, judges, and emulates the behavior as part of a model-trialing cycle. Similarly, Park et al. conducted grounded theory research about how surgical residents learned professionalism via role modeling and created a theoretical framework of observation, reflection, and reinforcement (ORR).[55]

The Role Modeling Cycle in Medical Education

Using information from programme theory, the hidden process framework, and the ORR framework, and information gleaned from studies of role model efficacy and role model consciousness[33,52,56-58], Epstein's original active observation in clinical education framework was modified to serve as the foundation for this thesis project. The modification process is summarized in Table 2.1.

Table 2.1 Modification of Foundational Theoretical Framework

Alterations to Epstein's Framework	Reason for Modification
1. Removal of "active" from "active observation of role model	- Hidden process framework, as supported by the literature, posits that observations are not always necessarily intentional or focused on the part of the observer
2. Addition of "attitude" to "generalization and behavior change"	- Programme theory proposes that both skills (behaviors) and attitudes can be learned via role modeling
3. Replacement of "change" in "generalization and behavior change" with the word "modification"	- Hidden process framework highlights that this behavior / attitude change does not necessarily have to be emulation of what is observed. It could also include the adaptation or cessation of a behavior / attitude after witnessing something negative. So, the modification could be the presence of a new behavior / attitude and/or the absence of old ones. The term "modification" is more representative of this concept. Note: this is also in-line notion of vicarious reinforcements and restraints in SCT.
4. Addition of "Role Modeling: New or Modified Behaviors / Attitudes Observed by Others"	- Hidden process framework model-trialing cycle - Programme theory's "observation of modeled behavior" and "mutual observation of practice" components - Literature on near-peer role modeling
5. Addition of "Formative Assessment of Role Modeling"	- ORR Framework's "reinforcement" component

	- Programme theory's "dialogue about practice" mechanism - Programme theory explicitly states that feedback is a mechanism used to achieve an outcome (in this case, the outcome of increased role model consciousness)
6. Addition of "Increased Role Model Consciousness"	- Literature about how increased role model consciousness is achieved (i.e., via education and feedback / assessment) and what it leads to (i.e., reflection and behavior / attitude change)

As shown earlier in Figure 1.3, the process begins with the observation of a behavior or attitude demonstrated by another person (i.e., a role model). Then, through a series of either unconscious cognitive processes or active reflective practices, the observed behavior / attitude prompts the observer to modify their own, via emulation or rejection of the observed behavior or attitude. To highlight the self-propagating nature of this cycle, additions were made to note that the modified behavior demonstrated by the initial observer may then be observed by another learner. To incorporate the emerging importance of role model consciousness and the need for formative role modeling assessments, additional items were added to the cycle, as indicated by the dashed arrows.

This dashed arrow portion of the role modeling cycle diagram aligns with the concepts presented in the experimentation and adaption phases of the hidden process framework. The entire cycle as a whole aligns with the components of the programme theory framework that address trainees observing the practice of others and then incorporating those observations into their own practice. It also aligns with the entire ORR framework in which something is observed, reflected upon, and then refined.

Literature Review

The following literature review will first discuss the understood importance of role modeling in medical education before addressing its particular importance for early trainees. Then, studies regarding areas in which trainees have been influenced by role modeling will be reviewed. Next, the literature highlighting important role model characteristics, including role model consciousness, will be summarized. This section will conclude with a review role modeling assessment and the emerging literature on near-peer role modeling.

Role Modeling in Medical Education

Famed medical educator Daniel Tosteson once wrote, "We must acknowledge…that the most important, indeed the only, thing we have to offer our students is ourselves. Everything else they can read in a book".[59] Though the sentiment reflected in this quote seems quite simple, role modeling's place in medical education is incredibly complex and dynamic.[14,60] As mentioned in the first chapter, role modeling has always been incredibly important for multiple areas of trainee development, including clinical skills and professional identity formation. The authors of one grounded theory study in which medical students and attending physicians were interviewed about physician role modeling, concluded that, "role modeling effectively enhances the transformation of the student to a doctor".[42]

In two systematic reviews about the state of role modeling in medical education, it was noted that medical students and residents have repeatedly reported that role models play a significant part in their medical education, and trainees and clinical teachers alike consistently reported that role modeling is how a large proportion of clinical learning occurs.[28,41,60] Role models in academic medicine have been proposed to function as teachers, guides, and

exemplars.[61] In a multi-institution exploratory study of pediatric residents' perceived sources of learning, the most frequently-reported source was learning by unintentionally observing role modeling.[62] On the basis of the studies reviewed, there is a clear consensus that role modeling is an important avenue for teaching and learning both for concrete clinical skills and teaching methods as well as for more abstract areas like professionalism, professional socialization, and professional identity formation.

Importance of Role Modeling for Trainees

Role modeling is understood to be important at all stages of a medical professional's training and career, but there is a presumably higher impact for trainees as they begin to form their professional identities.[28,41,60-62] Additionally, the magnitude of said impact is amplified for trainees as they are still forming their practice habits and have many working years ahead during which habits formed early on may be reinforced. As the previously-mentioned review article points out, exposure to both positive and negative role modeling can have profound long-lasting effects on trainees, who are particularly impressionable during the early stages of their professional identity formation.[28]

In an explanatory sequential mixed methods study, the authors collected quantitative survey data from 75 attending physicians about early influences of role modeling in their own professional lives. Eighteen were then interviewed to generate qualitative data. Thematic analysis suggested that the attending physicians both modeled certain behaviors after positive role models encountered when they were in training and modified their behaviors to avoid emulating negative role models they observed.[43] Based on this data, the authors concluded that both positive and negative qualities may be acquired early on in medical training through

observing the role modeling of their attending physicians and that these influences can persist throughout one's career.[43]

In a qualitative grounded theory study of non-medical professionals, the data suggested that the specific utility of role models changes as one progresses through one's career. Early career stage professionals look to role models to aid in creating a viable professional identity whereas mid to late stage career professionals use information gleaned from role models to refine and affirm that identity.[15] This highlights the concept that early career professionals, equivalent to GME trainees, may be more significantly impressionable as a consequence of their stage of training.

Domains of Potential Influence by Role Models

There are studies that focus on how trainees are influenced by role models in specific areas of their professional development, such as communication style, clinical skills, empathy, professionalism, or medical decision making. In a small but extensive longitudinal qualitative study of 10 pediatric residents and 10 pediatric community preceptors, residents reported emulating their preceptors' communication styles, interprofessional collaboration, and clinical reasoning skills.[30] The thematic analysis also suggested that role modeling is both an explicit and implicit process that unfolds in the clinical environment and that there may be discordance between the perspective of the resident and that of the attending. For example, observing the skills and attitudes exhibited (i.e., role modeled) by their preceptor was an intentional learning strategy for all residents in this study but not all preceptors reported using role modeling as an intentional teaching strategy.[30]

One qualitative study of 14 medical interns and 6 attending physicians demonstrated that the interns' empathy towards patients was influenced by their observations of both explicit and implicit role modeling exhibited by attending physicians.[63] Another multi-institution observational qualitative study found that attending physicians identified as excellent clinical teachers primarily transmitted their knowledge and skills about empathy and humanistic patient care via implicit and/or explicit role modeling.[44]

Professionalism as it relates to role modeling is one of the more common areas of influence cited in the literature, recognized by both learners and teachers alike. Role modeling is part of the pedagogy in all three frameworks of professionalism (virtue-based, behavior-based, and PIF), which speaks to the importance of role modeling in teaching professionalism within medical education.[64] In an essay published in *Academic Medicine*, two medical students eloquently recount how they are learning professionalism. They highlight the conflict that exists between the degree of professionalism expected of them and the unprofessional behavior modeled by their superiors.[65] A multi-institution qualitative grounded theory research study explored how surgery residents learned professionalism. Though residents and attendings reported learning professionalism from many sources, (such as formal instruction and structured residency expectations) learning from role models was reported as the most pervasive and important source.[66] The role models most often identified were either attending physicians or senior residents.[66]

A large quantitative study performed at the University of Ottawa found that medical students in all years of training identified role modeling as the most valuable method of learning professionalism.[22] A case study of a faculty development program designed to help attending

physicians teach residents professionalism concluded that role modeling was certainly necessary, though not sufficient, to teach professionalism.[67] A needs assessment survey conducted among a national group pediatric gastroenterology fellows reported that attending role modeling was the most frequent method for learning professionalism, followed by informal discussions with attendings and informal discussions with other fellows.[68] A similar, though smaller, study of intensive care fellows, reported that "observation in daily practice" was considered to be the most important method for learning professionalism.[69]

Connections between role modeling and clinical skills have been reported as well. In one correlational study, attending physicians who were identified as "clinically excellent" by colleagues were significantly more likely to be named by residents as positive role models.[70] In another study of student-identified physician role models conducted at two medical schools, physicians were asked to rank which student-identified role model characteristics they felt were most important to model for medical students. Clinical reasoning was ranked as most important overall. The study also noted that physician role models felt that modeling "enthusiasm for one's work" was influential in a student's desire to pursue a similar medical specialty, but did not mention if students felt the same way.[71]

Career choice has been postulated as an area of potential role model influence. Studies of medical students and non-physician healthcare professionals seem to support this to varying degrees. A national longitudinal study of medical students in the United States reported that the clinical specialty of a student's most admired physician role model was a statistically significant predictor of that student's residency specialty choice.[72] Similarly, a qualitative study of early career stage dentists concluded that role modeling by more senior professionals played an

important role in not only how they learned professionalism but also in the career trajectories they chose.[40]

One of the outcomes of physician role modeling identified in a large qualitative study was, "the shaping of career aspirations" of medical students.[42] Another qualitative study identified role models as having significant influence on postgraduate specialty training choices.[25] A cross-sectional study of graduating medical students suggested that students select role models based on certain attributes and that the influence of selected role models impacts their specialty choice.[73] A systematic review analyzing literature published over a 15-year time period about factors that influenced the decision to pursue a career in academic medicine cited the influence of role models and mentors as one factor.[74] Thus, based on the literature cited here, data suggests that role modeling has the potential to influence which area of medicine medical students decide to pursue as a career, as well as multiple other areas of trainee professional development.

Role Model Characteristics

The characteristics of physicians considered to be positive or negative role models has been well-documented, with similar findings across different specialties and countries.[6,24,30,41,43,50,75] In an extensive meta-analysis done to more precisely characterize attending physician role model attributes from the perspective of residents and fellows, common characteristics of positive and negative role models were identified. Results were grouped into three domains: patient care qualities, teaching qualities, and personal qualities. Clinical competence, dedication, humanistic attitude towards patients, enthusiasm for their work, creating a constructive / accessible learning environment, and a high degree of professionalism were

identified as highly important.[6] Personal qualities such as honesty, adaptability, and willingness to collaborate were deemed to be characteristic of positive role models. In addition, being aware of one's role model status (i.e., role model consciousness) was considered an important characteristic of positive role models.[6] Negative role models expectedly had contradictory qualities, such as cynicism and poor communication skills.[6] The authors suggested that enabling trainees to recognize these qualities and employ reflective practices would optimize their learning.

In another often-cited extensive review article, the characteristics of role models are similarly divided into three major categories: clinical competency, teaching skills, and personal qualities.[27] Clinical competence was noted to include clinical exam skills, effective communication, and clinical reasoning. Teaching skills included attributes that promote transmission of knowledge, such as role model consciousness, timely feedback, explicit identification of what is being demonstrated, and open reflection. The broader category of personal qualities included items typically associated with professionalism like compassion, honesty, enthusiasm, collegiality, and interpersonal skills. The article also highlighted the power of the "informal curriculum" and noted that role models (including peers and superiors) contributed to the implicit curriculum.[27] The review concludes with potential strategies with which attending physicians may improve their role modeling, such as facilitating reflection for learners, being explicit about role modeling, and increasing their own role model consciousness.[27] Clinical competency, teaching skills, and personal qualities were again identified as important areas in which role models may, formally and informally, demonstrate behavior or attitudes to be emulated by others.

Additionally, in a mixed methods study done at an Iranian medical school, 282 medical students completed questionnaires to identify the features they considered most important in a role model. A sample of those surveyed were then interviewed. Similar to the aforementioned systematic reviews, the students identified personal qualities, clinical competence, teaching ability, and professionalism as important characteristics of both positive and negative role models.[50] Other studies have subsequently reported both quantitative and qualitative data with similar results, citing individual characteristics, clinical competence, teaching skills, and professionalism as important attributes of both positive and negative role models.[61,75-77] Thus, the literature supports the notion that at least three prominent categories of role model characteristics exist: a clinical domain, a teaching domain, and a personal / interpersonal domain.[6,27,50]

The Importance of Role Model Consciousness

Role model consciousness (RMC) is the active awareness of one's position and function as a role model. Though not necessary for observational learning via role modeling to occur, RMC does increase the efficacy and quality of positive role modeling.[33,56] One way to exhibit role model consciousness is to be intentionally explicit about what is being demonstrated. In a workshop designed to promote role modeling skills amongst anesthesiologists, discussions with focus groups of attending physicians and residents revealed that both groups considered role modeling to be important, particularly for professionalism and communication skills.[52] However, explicit role modeling was underutilized due to different expectations of the groups involved. Residents expected and preferred more explicit role modeling while attending physicians were not always actively aware of that expectation.[52] The authors concluded that clinical teachers would benefit from education to support more explicit, effective role modeling.

In a prospective cohort study of medical students during their pediatric clerkship at a large U.S. medical school, students assessed the efficacy of a novel educational intervention called "Students' Clinical Observations of Preceptors" (SCOOP). Students would observe and assess their preceptors during clinical encounters using a structured worksheet to intentionally focus their attention on certain areas of the preceptor-patient interaction. Preceptors were aware of this process as it was happening. Students and preceptors would then discuss the student's observation afterwards. In a post-intervention survey of student participants, the majority of participants could identify one or more skills (clinical, professional, or interpersonal) they gained specifically during the SCOOP exercise.[33] Faculty participants reported that they became more mindful of their behaviors and attitudes and more deliberate and explicit in how they demonstrate certain skills, even after the SCOOP exercise was complete.[33] The SCOOP exercise demonstrated that intentional role modeling by a physician with adequate role model consciousness was an effective way to teach professional behavior. It also underscored the benefit of teaching medical students to focus their observations and engage in reflective practice to gain maximum benefit from their observations of role modeling.[33]

Feedback regarding how one is perceived as role model can improve role model consciousness and role modeling behaviors. In a study of surgical residents and attendings, residents defined characteristics of positive role models in general and then rated their attendings in each of the identified domains. The attendings received their respective conglomerate scores and a bit of narrative text about their performance, including how they scored compared to others. Without any other training or intervention employed, the attendings' role modeling scores improved during the next set of evaluations. The feedback and subsequent increased role model

consciousness alone was seemingly effective at improving role modeling behaviors amongst attendings.[56]

Assessment and Improvement of Role Modeling

There are single-institution studies that describe different faculty development programs effectively used to improve role model consciousness and skills. Most are qualitative studies and do not clearly describe the assessment method used to measure improvement in the targeted role modeling-related areas.[34,36,78] Three studies in the literature notably deviate from this pattern.

The first was unique in that it used a randomized control trial (RCT) study design. In this small RCT, junior faculty at the University of Tehran were divided into intervention and control groups. The intervention group completed a faculty development program aimed at increasing their awareness of their role model status and converting implicit behaviors to explicit ones. Intervention subjects reported satisfaction with the curriculum and pre/post tests confirmed an increase in knowledge and role model consciousness.[35] There was no difference in behavior as measured by trainee evaluations when evaluations were compared between the control and intervention groups or within the experimental group pre and post-intervention. The authors speculated that the lack of demonstrated behavioral difference was due to high baseline behavior scores for the physicians who volunteered for the study. The behavior assessment tool used in the study is not fully described.

The second study was a multi-institutional prospective cohort study that investigated whether or not a specific faculty development curriculum enhanced the ability of faculty members to demonstrate humanistic teaching and good role modeling, as evidenced by their trainees' evaluations of them using the "humanistic teaching practices questionnaire". The study

found a significant difference in evaluation results between faculty who completed the curriculum and their matched controls.[31] This study was unique in that it used an existing validated tool to assess a component of role modeling and was conducted at multiple institutions.

The third notable study is one in which a tool to assess attending physicians as role models was created and validated. The Role Model Apperception Tool (RoMAT) consists of 17 items scored on a 5-point Likert scale. The items are divided into two clusters ("caring attitude" and "effectiveness") that each contain items addressing personal qualities, teaching abilities, and clinical skills. The tool was designed to serve two purposes; to help trainees identify positive and negative role modeling to aid in their own PIF and to provide formative feedback to the attending physician about their own role modeling skills.[79]

A related study found that using the RoMAT to provide feedback to physicians resulted in improved role modeling behavior.[57] The original study RoMAT was conducted in the Netherlands with general practitioners (the equivalent of an attending physician in the U.S.) and their trainees in the outpatient setting. The tool was later also validated in the sub-specialty training environment where trainees interacted with multiple supervising physicians.[80] It has not yet been validated for assessing the role modeling skills of residents or fellows, though this would be a logical evolution of this research given the importance of near-peer role modeling in medical education.

Near-Peer Role Modeling

Recognition of the importance of near-peer role models is not novel. The majority of the literature discusses near-peer role modeling within the context of undergraduate medical

education.[77,81-83] However, there are studies that address near-peer role modeling solely within the GME context as well as some that discuss residents as role models for medical students.

In a randomized comparative mixed methods study of second-year medical students participating in mandatory small group reflective sessions, data suggested that groups led by Gold Humanism Honor Society senior medical students (who were presumed to be positive role models) achieved higher average reflective scores when compared to non-facilitated groups or groups led by non-honor society medical students.[81]An in-depth synopsis of focus group discussions about role modeling in medical education published over 30 years ago identified residents as important role models for medical students and for each other.[84] The same synopsis also postulated that residents who are stressed or preoccupied with their clinical or academic responsibilities may not fully realize the impact their role modeling can have on others.[84] An important and often-cited cross-sectional study conducted over a decade ago reported that 35% of graduating medical students identified at least one resident as a chosen role model.[73]

Studies of residents as role models have started to emerge more in the literature over the last decade.[39,85,86] One interesting qualitative study analyzed interviews with residents in internal medicine, surgery, and pediatrics to explore their understanding of their position as role models and their perceptions regarding how learning from role modeling occurs.[39] The data suggested that residents understood that their co-residents and medical students learned through resident role modeling in the clinical environment but that residents felt this was not typically something the resident role model was consciously aware of in real time.[39] Residents also reported learning how to role model by observing both positive and negative role models themselves. One of the most interesting findings of this study was that residents perceived a clear distinction between

the act of role modeling and the title of role model. Residents acknowledged that they engage in role modeling frequently but noted that they did not consider themselves to be role models, which they felt was more of an aspirational designation.[39]

In a cross-sectional survey-based study at a large Canadian university, graduating medical students were asked about their preceptors and resident role models. For context, it is important to note that they approached this study from the perspective that students intentionally choose role models. The authors defined a role model as, "a person considered as a standard of excellence to be imitated"[85], which differs from the definition used for this thesis study. Medical students reported that resident and attending physician role models were equally important in their education overall.[85] The most important attributes considered in selecting a resident role model were reported to be "respectful attitude towards students" and "making time to teach", followed closely by "effective interpersonal skills", "honesty / integrity", and "clinical reasoning".[85] These attributes were similar to those reported to be important to medical students when selecting an attending role model.

There have also been numerous studies of near-peer *teaching* which, although not equivalent to role modeling, does substantiate some transferrable concepts with near-peer role modeling. For example, Bulte et al describes the "cognitive and social congruence" within near-peer teacher / learner pairs as something that facilitates a safe learning environment and promotes the teaching of training-level-appropriate material.[83] The data from their cross-sectional survey study suggested that near-peer teachers also served as role models for their learners.[83] Near-peer or peer-assisted teaching has been reported as an effective strategy for medical education and has shown to benefit both the teacher and the learner.[82,86,87]

Limitations and Gaps in Literature

Most of the relevant literature focuses on the attending physician as the role model and the medical student as the learner. The second most common dyad represented in the role modeling literature is that of the attending physician as the role model and the resident as the learner. A smaller portion of the literature addresses the concept of near-peer role modeling with residents typically identified as the role models. The role modeling literature consists mostly of systematic reviews, editorials, and small descriptive studies, though a few larger, multi-institution studies with more rigorous study design have been published as well.

Many, though not all, studies presented here have a relatively small sample size and/or were conducted at a single institution, thus limiting their power and generalizability. Many of the studies described in this chapter were qualitative studies. While most offered rich, contextualized data, their qualitative methodology makes it inherently difficult to verify results or infer causality. The results can be also biased by the subjectivity of qualitative data analysis. Many of these studies, particularly those that used qualitative methodology, relied on self-reported data which is inherently prone to multiple biases. The few quantitative studies described in this chapter rarely used validated instruments to collect data, with rare exceptions mentioned earlier.

Though there are many large gaps in the literature regarding role modeling in medical education, the most conspicuous is the apparent lack of published research regarding fellows as role models. There were no published studies found during this extensive literature search that describe, quantify, or postulate about the potential impact of fellow role modeling on residents or on the fellows themselves. There are also no validated tools in the literature that aim to assess the quality of role modeling exhibited by fellows. Unsurprisingly, there are also no published

curricula for how to teach or improve role model consciousness or role modeling skills for fellows. Though there is mention of subspecialty fellows as teachers for residents in the literature, the phenomenon of fellows as role models has yet to be explored.

Summary

There is consensus in the literature that role modeling plays a vital part in medical education and is an effective means of teaching and learning. The influence of role modeling may be greatest for those early on in their medical training, such as medical students and residents. Studies show that trainees are influenced by role models in multiple areas of their professional development, such as clinical reasoning, professionalism, empathetic patient care, communication skills, and career goals. Trainees often emulate only specific characteristics of individual role models; determining which attributes of different role models to emulate may not always be a conscious choice.

Three prominent groups of role model characteristics have been identified in the literature: a clinical domain, a teaching domain, and a personal / interpersonal domain. The quality and efficacy of role modeling on the part of the attending physician is best when the physician is conscious of their position as a role model and of the potential impact their modeling could have on learners. Assessment and feedback about one's performance as a role model can improve role model consciousness and behavior. Many faculty development programs aimed at improving the role modeling skills and consciousness of attending physicians have been described and at least one validated role modeling assessment tool has been studied. If any formalized curricula or assessment tools exist to address role modeling by trainees, they are not easily found in the literature.

Near-peer role modeling has been studied in the context of student-student, resident-student, and resident-resident dyads and has been found to be an effective educational strategy that benefits both the observer and the role model. However, similar to studies of attending physicians, trainees are not always consciously aware of their position as role models. Interestingly, there is little mention of fellows in the near-peer role modeling literature.

Though there is a lot of literature about role modeling in the context of medical education, there is a paucity of literature specific to fellows as role models. The perceptions about and impact of near-peer role modeling in certain settings has been explored, but not within the fellow-resident trainee context. The study at the center of this thesis adds to the literature by specifically focusing on fellows as role models and the perceived impact of fellow role modeling on residents' professional development.

Chapter 3: Methods

Introduction

The purpose of this prospective exploratory survey-based cross-sectional study was to describe and compare what pediatric residents and pediatric subspecialty fellows believe about the influence fellow role modeling has on residents at a large freestanding Midwestern children's hospital. This study was designed to serve two purposes: to provide data about how fellows as role models (FaRMs) influence residents within this specific institution and to serve as a pilot for larger studies that could then be generalized to other populations. This chapter will first review the study's research questions and then describe study design, population / sample, instrumentation, data collection, and data analysis procedures.

Research Questions

1. What do residents believe about how they are influenced by exposure to fellow role modeling?
    1A. What relationships exist between resident characteristics and their beliefs about the influence of fellow role modeling?
2. What do fellows believe about how their role modeling influences residents?
    2A. What relationships exist between fellow characteristics and their beliefs about the influence of their role modeling?
    2B. What relationships exist between fellow characteristics and role model consciousness?

3. What similarities and differences exist between resident and fellow beliefs regarding the influence of fellow role modeling on residents?

Study Design

An observational cross-sectional survey design was selected due to it being a relatively inexpensive and time-efficient study design.[88] This was of particular importance in this study, as there was a strict time constraint and no readily accessible funding. A survey design is also the most appropriate for this study's purpose, as surveys can provide quantitative data about the beliefs of a large number of study participants and can generate data to test for associations among variables within the sample.[88] A mixed-methods study design would have been ideal for the purposes of this exploratory study, but such a design was not feasible due to resource constraints. Though an experimental design would have been more rigorous, it was not appropriate for the purpose of this study because the goal was to examine multiple variables as they currently exist without manipulation. It was also not feasible because there was no pre-experimental data on which to base a hypothesis.

Population and Sample

The populations of interest were the pediatric residents and pediatric subspecialty fellows at a large freestanding children's hospital in the Midwest. The population was identified through a multistage process. First, all groups belonging to the GME trainee population at the institution were identified through resident program roster and individual fellowship program rosters on the institutional website. These rosters were compared with GME email listservs to ensure accuracy. Once all GME trainees within the institution were identified, trainees that were excluded from the population of interest were identified.

Pediatric surgery residents and surgical subspecialty fellows were excluded because of potential differences in role modeling and culture within a procedure-based subspecialty. Child psychiatry fellows and pathology fellows were excluded because of their limited interaction with pediatric residents. Internal Medicine-Pediatrics residents were excluded because delineating which of the PGY-1 residents had been exposed to pediatric subspecialty fellows versus those who had not yet had that exposure was impractical. There also was no way to counter the potential confounding that would result from intermittent exposure to adult medicine fellows. The remaining GME trainee population, which consisted of categorical pediatrics residents, pediatrics-genetics residents, child neurology residents and fellows, and non-surgical pediatric subspecialty fellows (minus this author) served as the target population for this study. After the appropriate exclusions were made, the total eligible resident population consisted of 123 trainees and the total fellow population consisted of 128 trainees. The entire population (census) was invited to participate in the study.

There were no published studies similar enough to this study on which to base target response rate. So, both the Krejcie Table[89] and the Medical Education Research Study Quality Instrument (MERSQI)[90] were referenced to determine a target response rate to ensure a representative respondent pool. Based on the resident and fellow population sizes, the minimum necessary response rate was 75% for both the resident survey (n=93) and the fellow survey (n=96) in order to reasonably ensure a representative respondent pool.

As no pilot data had been collected for this study and no similar studies were evident in the literature, a standardized effect size was used for the power analysis. For this study we aimed to detect a moderate effect size with a Cohen's d of 0.4.[91] A power analysis using the Wilcoxon

rank sum test with a 5% type 1 error (alpha of 0.05) and a power of 0.8 was performed. From this analysis it was found that 95 participants in each group would be required.[92] With sample sizes of 95 per group, there is 80% power to detect a moderate effect difference in mean response scores between fellows and residents using a Wilcoxon rank sum test and 5% type I error. Therefore, in order for the respondent pools to be both adequately representative and large enough to detect at least moderate differences between groups, a response rate of 77% for both the resident group (n=95) and the fellow group (n=96) was targeted.

Sampling Procedures

Every member of the study population was invited to participate in the study. Because of the convenience for study participants and the instant data availability / accessibility for the researcher, an electronic survey via the SurveyMonkey[93] platform was used. Invitations to participate in the study were sent via institutional email. Emailed invitations included the link to the electronic survey, a brief explanation about the survey instrument, an estimate regarding how long survey completion would take, and the deadline for survey completion.

Instrumentation and Measures

There was no existing validated survey tool available relevant to the purpose of the study, therefore a survey tool was instead created by this study author. A 24-question resident survey and a 26-question fellow survey were used in this study, as shown in Appendix A. Survey questions were developed and refined using information garnered from an extensive literature review, contributions from a panel of medical education experts, and feedback from GME trainees. Because there was not robust literature available specific to fellow role modeling, the areas of potential role model influence explored in the first twelve survey questions were

identified after extensive literature review of role modeling at the attending, resident, and medical student levels.

Studies reported that areas of role model influence for trainees included communication, empathy, professionalism, career choices, clinical skills, and medical decision-making.[23,42,44,94] Due to the importance of reflective practices in medical education and professional identity formation[27,34] and because it is highlighted in the ACGME role modeling subcompetency for pediatric fellows[46], it was added as another area of potential influence. The original questionnaire was piloted with a small convenience sample of 3 residents and 3 fellows. Two additional areas, "handling difficult situations" and "leadership style" were added or modified based on feedback from residents and fellows during the survey pilot phase. After the 12 primary influence areas were chosen, the content was reviewed by a panel of two medical education experts to further insure content validity. A 5-point Likert-like scale was used with the understanding that it was not a true Likert scale. Questions 1 through 12 are shown in Table 3.1 below.

Table 3.1 Resident and Fellow FaRMs Survey Questions: Part 1

Resident Survey	Fellow Survey
On a scale of 1 to 5, with 1 being "no influence" 5 being "major influence", rate to what degree your observations of fellows' attitudes and actions (both positive and negative) have influenced your development in the following areas. Please note: you are not rating the quality of their influence (i.e., good or bad), just the magnitude (i.e., no influence to major influence).	On a scale of 1 to 5, with 1 being "no influence" and 5 being "major influence", rate to what degree you believe residents' observations of your attitudes and actions (both positive and negative) influence interns/residents' development in the following areas. Please note: you are not rating the quality of your influence (i.e., good or bad) on residents but rather the magnitude (i.e., no influence to major influence).

1. Medical decision making
2. Procedural or clinical exam skills
3. Communication / interaction with patients and their families
4. Communication / interaction with non-physician healthcare workers
5. Communication / interaction with other physicians
6. Communication / interaction with medical students
7. Reflective practices (ex// debriefing; seeking and applying feedback; discussing mistakes; discussing the personal impact of difficult cases, etc.)
8. Empathy towards patients / families
9. Handling difficult situations (challenging patient scenarios, interpersonal conflict)
10. Career goals / choice of subspecialty
11. Teaching methods
12. Leadership style

No opinion	1 (no influence)	2 (slight influence)	3 (moderate influence)	4 (a lot of influence)	5 (major influence)

Three additional questions were added to explore the relationship between role modeling and certain indicators of burnout. Two questions on the resident and fellow surveys address resident engagement and enthusiasm at work and their sense of belonging as a valued member of the healthcare team, as shown in Table 3.2. Those two specific topics were chosen based on literature that identified engagement at work and team connectedness as characteristics inversely related to physician burnout.[95,96] A question about positive influence on others, which was asked on the fellow survey, was taken directly from the Maslach Burnout Inventory Questionnaire, a validated burnout assessment tool.[97]

Questions about respondent attributes such as PGY level, current or prior residency program type, current or intended subspecialty, prior role model training, and prior exposure to fellows (Q17-20 on resident survey and Q15,17,20-22 on fellow survey) were included to compare answers between subgroups. The decision to collect data about respondents' gender,

race, and ethnicity was rooted in literature review[26,98,99] and was made in an effort to explore the interaction between demographic variables and perceptions about role modeling.

Table 3.2 Resident and Fellow FaRMs Survey Questions: Part 2

Resident Survey Questions	Fellow Survey Questions
13. To what degree do fellows' attitudes and actions impact your enthusiasm / engagement at work?	13. To what degree do your attitudes and actions impact interns' and residents' enthusiasm / engagement at work?
14. To what degree do fellows' attitudes and actions impact your sense of belonging as a valued member of the healthcare team?	14. To what degree do fellows' attitudes and actions impact your sense of belonging as a valued member of the healthcare team?
Answer Options	
No Impact | Slight impact | Moderate impact | Large impact | Major impact	

Response process validity was addressed during the pilot survey phase, in which 3 pediatric subspecialty fellows and 3 pediatric residents were asked to complete the preliminary version of the survey. Each of the 6 trainees met individually with this study author and were asked to verbalize their rationale while working through each survey question to confirm that the questions were being interpreted as intended. The wording of problematic questions was refined and re-discussed with members of this pilot group before being reviewed again by the panel of medical education experts. Response times were also analyzed for the final instrument – with an average response time of approximately 4 minutes for both residents and fellows. There were no significant differences in answer choices detected among those who took more or less time to complete the survey.

Because the instrument seeks to measure individual perceptions of their own experiences, interrater agreement was not considered a relevant indicator of reliability and was not assessed.

Factor item analysis was not possible for every survey item. Instead, relationships to other variables (i.e., whether instrument scores correlate with similar / different measures as expected) were explored. Where analysis was feasible, the relationships to other variables did suggest some degree of internal validity. For example, a Spearman correlation test was performed to assess whether there was an association between the fellows' reported degree of role model consciousness and their composite score of perceived influence; a positive association was identified ($r=0.29$, $p < 0.05$). These associations alone are not enough to substantiate these surveys are internally valid instruments but do suggest some degree of reliability.

Data Collection

The questionnaires were distributed via email through SurveyMonkey[93] to all eligible residents and fellows at the study institution. An incentive for completing the survey was offered and consisted of entry into a raffle for a $50 gift card. Participants were given a 2-week deadline to complete the survey between 9/24/21 and 10/8/21. Reminder emails specifically targeting trainees who had not yet completed the survey were sent one week after the initial invitation and again one day before the response deadline.

Rather than sending a single email to all members of the population en masse, invitations were directed towards subgroups within the population. For example, each resident PGY level class received a different email invitation specifically addressed to their respective class. Subspecialty fellows received invitations addressed to their individual subspecialty groups. A humorous message was included with each reminder email in an effort to increase response rates.[100]

These semi-personalized outreach methods along with a user-friendly survey designed to take less than 5 minutes to complete were used to mitigate non-response error. There appeared to be very little sampling error. The PGY-level and demographic characteristics of the respondents were proportional to the estimates of the study population as a whole, suggesting that the respondent pool was indeed representative of the population. The electronically-collected survey data were then directly transferred into Excel spreadsheets and coded in preparation for data analysis.

Data Analysis Procedure

Statistical analyses were completed using the base R statistical package (R Foundation for Statistical Computing, Vienna, Austria) and SAS software, version 9.4 (SAS Institute, Cary, NC). DATAtab Team (2022). Additional analyses and graphics construction were performed using DATAtab: Online Statistics Calculator. (DATAtab e.U. Graz, Austria. URL https://datatab.net) and GraphPad Prism (version 8.0.0 for Windows, GraphPad Software, San Diego, California USA).

Descriptive statistics were used to summarize demographic characteristics and survey question responses. The same Likert-like scale was used for survey questions 1 through 12, so the mean score for each individual respondent was calculated by averaging their responses to those questions. Composite scores for the resident respondent group and the fellow respondent group were calculated by averaging the individual mean scores within each respective group. Composite scores could range from 1 to 5 with a score of 1 indicating “no influence” and 5 indicating “major influence”. The composite scores were calculated to measure the overall perception of FaRMs influence from the perspective of both groups. Composite scores ≤ 2

represented “very small” influence, 2.01-2.5 represented “small” influence, 2.51-2.99 represented “small to medium” influence, 3-3.49 represented “medium” influence, 3.5-3.99 represented “medium to large” influence, 4-4.49 represented “large” influence, and 4.5-4.99 represented “large to very large” influence. Note: because “no opinion” was an answer choice for questions 1 through 12 and was without a scaled value, means were a better representation to use for the composite scores than the sums.

Due to the Likert-like nature of the survey questions and the non-normal distribution of the data, non-parametric methods were used to make comparisons between groups. Wilcoxon rank sum tests were used to compare composite scores as well as responses to individual survey items between residents and fellows. Mean and 95% confidence intervals (CI) were calculated for composite scores and individual survey items for both groups. Spearman correlation coefficients were used to assess for associations between answers to each of the survey questions within the resident and fellow groups and are presented as a correlation matrix in the next chapter. A Spearman correlation coefficient of 0.1 was used as the threshold for determining a plausible correlative relationship. For all comparisons, data was considered statistically significant if $p<0.05$. Missing data were rare, but any missing data were treated as missing at random. Responses of “no opinion” (fewer than 2% of responses) were excluded from analyses.

Ethical Considerations

There were no true ethical concerns or considerable risks for participants in this study. The institutional review board (IRB) at the study institution reviewed the study proposal and declared the study exempt from IRB human subject review. However, there were considerations about the necessity of collecting some of the demographic information. It is important to note

that the demographic data received, such as race, ethnicity, and gender were provided voluntarily. Participants could choose not to disclose this information. The information was requested with a distinct study purpose, which was disclosed to participants at the time of data collection. A disclaimer was also included in the survey instructions which stated that demographic information, along with all survey information, would be identifiable to the study author if the respondent included their contact information.

No residents were unintentionally excluded from the study due to not being available during the short turnaround time of the survey. Specifically, no residents were away on maternity leave or medical LOA, traveling internationally, or away presenting at conferences during the two-week time frame. This was not possible to determine for the fellows, but unavailability due to international travel was unlikely as there were pandemic-related travel restrictions for hospital employees in place at the time. No automated email replies were received indicating any fellows who received the emailed invitation were unavailable during the study period.

Chapter 4: Results

Introduction

In this chapter, characteristics of study participants will be described. The results of the study will be reported, and statistical analyses interpreted. Resident survey results will be reported first, followed by fellow survey results. Then, results of each will be compared. The chapter will end with a brief summary to set the stage for the final chapter in which the meaning of the results will be explored.

Participants

The population of interest for this study consisted of all non-surgical pediatric residents (N=123) and pediatric subspecialty fellows (N=128) at a single large freestanding children's hospital in the Midwestern United States. All members of the target population were invited to participate in this study by completing an electronic survey. Of the 123 eligible pediatric residents, 96 responded. Of the 128 eligible pediatric subspecialty fellows, 100 responded. Thus, the total response rate for each group was the same at 78%. Of note, there were some questions skipped by some participants. A minimum of 98 fellows and 95 residents responded to each question, for a complete response rate of 77%. This met or surpassed the minimum target response rates of 77% for residents and 75% for fellows.

For questions 1 through 12, a total of 9 residents and 10 fellows responded "no opinion" to a survey item, with 2 residents and 8 fellows choosing "no opinion" for at least 2 questions.

Nearly all respondents provided demographic data, including their level of training, current or intended post-residency subspecialty, gender, race, age, and ethnicity. Table 4.1 and Table 4.2 describe the respondent characteristics.

Residents and fellows from each PGY level participated and the proportion of each PGY level is representative of the total population. Over two-thirds of respondents were female. Most residents were under 30 years of age and most fellows were over 30 years of age, as would be expected. Only 9% of fellows self-identified as part of a racial or ethnic group considered to be underrepresented in medicine (URiM). In the resident group, 21% of respondents self-identified as belonging to an URiM racial or ethnic group.

Approximately 77% of residents reported an intention to formally subspecialize after completing residency. A variety of intended subspecialties were represented, though no respondents indicated an intention to pursue pulmonology, nephrology, child abuse pediatrics, or adolescent medicine fellowships. Fellows from all subspecialties available at this institution participated in this study, with response rates per subspecialty ranging from 33% to 100%.

Table 4.1 Respondent Characteristics

Characteristic	Resident Respondents, n (%)	Fellow Respondents, n (%)	Total Respondents, n (%)
Level of Training			
PGY-1	28 (29%)	-	28 (14.3%)
PGY-2	31 (32%)	-	31 (15.9%)
PGY-3	34 (36%)	-	34 (17.3%)
PGY-4	1 (1%)	31 (31%)	32 (16.3%)
PGY-5	-	28 (28%)	28 (14.3%)
PGY-6	-	27 (27%)	27 (13.8%)
PGY-7 or higher	-	11 (11%)	11 (5.6%)
Not Disclosed	2 (2%)	3 (3%)	5 (2.6%)

Characteristic	Resident Respondents, n (%)	Fellow Respondents, n (%)	Total Respondents, n (%)
Self-Reported Gender			
Male	27 (28.4%)	23 (23%)	50 (26%)
Female	66 (69.5%)	73 (73%)	139 (71%)
Transgender	0	0	0
Nonbinary	0	0	0
Other, Not Listed	0	0	0
Not Disclosed	2 (2.1%)	4 (4%)	6 (3%)
Self-Reported Race			
Asian	7 (7.4%)	12 (12%)	19 (9.7%)
Black / African American	9 (9.5%)	2 (2%)	11 (5.6%)
Caucasian (White)	67 (70.5%)	69 (69%)	136 (69.4%)
Native American, Native Hawaiian, or Pacific Islander	0	0	0
Biracial: Asian and Caucasian	0	2 (2%)	2 (1%)
Biracial: Black and Caucasian	2 (2.1%)	0	2 (1%)
Other	6 (6.3%)	10 (10%)	16 (8.2%)
Not Disclosed	4 (4.2%)	5 (5%)	9 (4.6%)
Self-Reported Ethnicity			
Hispanic or Latino	8 (8.3%)	7 (7%)	15 (7.7%)
Middle Eastern or Northern African	1 (1%)	3 (3%)	4 (2%)
Not Hispanic / Latino nor Middle Eastern / Northern African	83 (86.4%)	85 (85%)	168 (85.7%)
Not Disclosed	4 (4.2%)	5 (5%)	9 (4.6%)
Age			
≤ 26 years	7 (7.3%)	0	7 (3.6%)
27-29 years	40 (41.7%)1	8 (8%)	48 (24.5%)
30-32 years	12 (12.5%)	41 (41%)	53 (27%)
33-35 years	2 (2.1%)	13 (13%)	12 (6.1%)
≥ 36 years	0	4 (4%)	4 (2%)
Not disclosed	34 (35.4%)	34 (34%)	68 (34.7%)

Table 4.2 Respondents' Subspecialty or Intended Subspecialty

Subspecialties (Population of NCH fellows, N)	Subspecialty of Fellow Respondents, n	Intended Subspecialty of Resident Respondents, n
Adolescent Medicine (3)	3	0
Allergy/Immunology (4)	4	2
Cardiology (9)	6	5
Child Abuse (3)	3	0
Developmental Behavioral Pediatrics (3)	1	1
Endocrinology (5)	5	1
Gastroenterology (6)	6	1
Hematology / Oncology (11)	11	11
Hospital Medicine (3)	3	10
Infectious Disease (4)	4	1
Neonatology (12)	12	8
Nephrology (4)	2	0
Neurology (13)	7	4
Palliative Care (1)	1	1
Pediatric Emergency Medicine (17)	11	5
Pediatric Critical Care Medicine (12)	11	3
Pulmonology (7)	4	0
Rheumatology (3)	2	3
Sports Medicine (1)	1	3
Genetics (0)	0	4
Undecided	n/a	9
Not disclosed	3	0
No intent to pursue fellowship	n/a	22

What do residents believe about how they are influenced by exposure to fellow role modeling?

In order to pursue this line of study in any depth, it was important to affirm the assumption that fellows do indeed function as role models for residents. To accomplish this, residents were asked to choose "Yes, I agree" or "No, I disagree" regarding the statement, "I can think of at least one fellow who has demonstrated an attitude, behavior, or skill that I have

subsequently tried to emulate in my own work." All respondents (100%) agreed with the statement, thus confirming the premise that fellows function as role models for residents.

Figure 4.1 summarizes the residents' overall responses regarding the magnitude of influence they believe FaRMs have had on their overall professional development, as reflected by the categorization of their composite scores. "Composite score" here refers to the mean of Likert-like scale responses (1 through 5) to the first 12 questions on the survey for each individual resident. Resident composite scores ranged from 1.58 to 4.75. The average resident composite score was 3.35, with a standard deviation of 0.69 and median of 3.33. As shown in Figure 4.1, resident composite scores suggest that most residents (73%) believe they were at least moderately influenced by fellow role modeling.

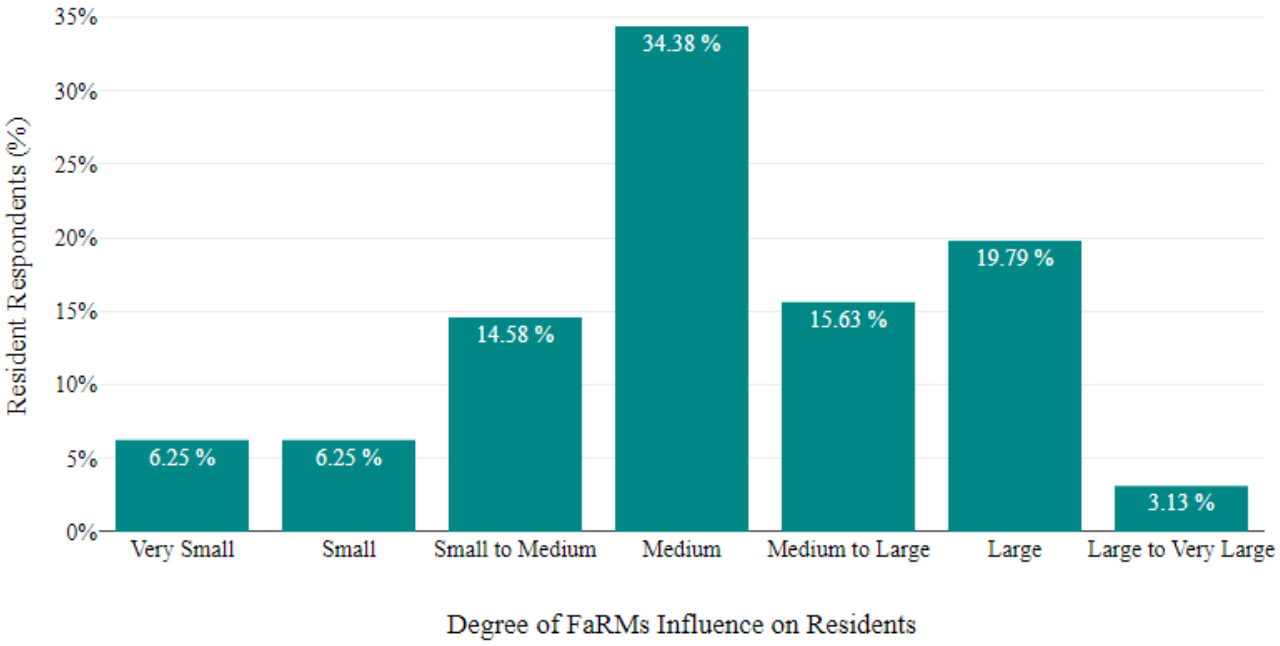


Figure 4.1 Categorization of Resident Composite Scores Regarding How Impactful Their Observation of FaRMs Has Been on Their Professional Development

Resident Perceptions of Areas of Resident Development Influence by FaRMs

Table 4.3 describes the resident responses to each of the survey items included in the composite score. This descriptive analysis shows which questions had the highest and lowest average responses on a scale of 1 to 5. Of the 12 areas of professional development included on the survey, "medical decision making", "leadership style", and "handling difficult situations" had the highest means and medians and least amount of variance. Conversely, "communication with non-physician healthcare workers", "career goals", and "communication with medical students" had the lowest means and medians. There was a large amount of variance within the resident response data set for "career goals", indicating a wide distribution of beliefs about this area of potential influence.

Table 4.3 Descriptive Analysis of Resident Responses to Survey Items 1 through 12

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Composite
Mean	3.85	3.49	3.46	2.92	3.32	3.07	3.21	3.3	3.54	3.03	3.51	3.57	3.35
Median	4	3	3	3	3	3	3	3	4	3	3	4	3.33
Mode	4	3	4	3	3	4	4	3	4	3	3	3	4
SD	0.82	1.09	0.98	1	0.95	1.16	1.15	1.08	0.98	1.41	0.96	0.95	0.69
Variance	0.67	1.19	0.96	0.99	0.9	1.35	1.32	1.16	0.95	1.98	0.91	0.9	0.48
Min	2	1	1	1	1	1	1	1	1	1	1	1	1.58
Max	5	5	5	5	5	5	5	5	5	5	5	5	4.75
Range	3	4	4	4	4	4	4	4	4	4	4	4	3.17

Resident-Reported Impact of FaRMs on Resident Wellness

Two survey items regarding areas that serve as indicators of burnout were addressed on the resident survey. Over 85% of residents reported that fellows' attitudes and actions had either a large or major impact on their (resident) enthusiasm and engagement at work. Over 90% of

residents reported that fellows' attitudes and actions had either a large or major impact on their sense of belonging as a valued member of the healthcare team.

What relationships exist between resident characteristics and their beliefs about the influence of fellow role modeling?

There were no statistically significant associations between resident age, PGY level, or gender and any of the survey item responses. There was a positive correlation between "intent to pursue fellowship training" and "FaRMs influence on career goals / subspecialty choice", which was statistically significant ($r = 0.39$, $p < 0.001$). There was no statistically significant correlation between residents' intent to pursue fellowship training and their composite scores ($r = 0.01$, $p = 0.95$).

Because 21% of residents reported belonging to racial or ethnic groups considered underrepresented in medicine (URiM), preliminary analyses comparing URiM residents and non-URiM residents were performed. Differences between URiM residents and non-URiM residents were detected in 4 out of the 12 areas of potential influence. In all four areas listed in Table 4.4, the URiM residents perceived FaRMs to be less influential when compared to the non-URiM resident group. There were no statistically significant differences detected in the remaining 8 areas of potential influence. It should be noted that these comparisons are likely underpowered. The analyses are reported here to serve as pilot data to prompt further study about how racial / ethnic identity may interact with perceptions of role model influence.

Table 4.4 Areas in Which Resident Responses Differed Based on URiM Designation

Resident Survey Items Regarding Perceived FaRMs Influence	Non-URiM Residents: Median Likert-Like Scale Response	URiM Residents: Median Likert-Like Scale Response	p-value	Effect size (*r*)
Composite Score	3.48	2.96	0.006	0.28
Communication with Medical Students	4	2.5	0.003	0.3
Reflective Practice	3.5	3	0.026	0.23
Handling Difficult Situations	4	3	0.0024	0.23

Relationships Among Residents' Beliefs about Role Modeling Across Different Areas of Influence

Figure 4.2 displays the Spearman correlation coefficient between each of the 12 areas of potential FaRMs influence (survey questions 1 through 12), the two resident wellness-related survey items (questions 13 and 14), the resident composite scores, residents' perceived degree of fellow role model consciousness (PRMC), and resident PGY level. Correlations which were not statistically significant were crossed out. All correlations noted were positive, though the strength of the positive correlation varied between different item comparisons. The composite scores had a moderate to strong positive association with each of the survey items that comprised the composite score. There were also moderate to strong positive associations between certain individual survey items, such as reported FaRMs influence on teaching methods and leadership style. Notably, there were only weak positive associations between some of the communication-related items. Residents' estimates of how aware fellows were of their position as role models did not have strong correlations with resident responses to any survey items. PGY-level had no association with response to any survey item.

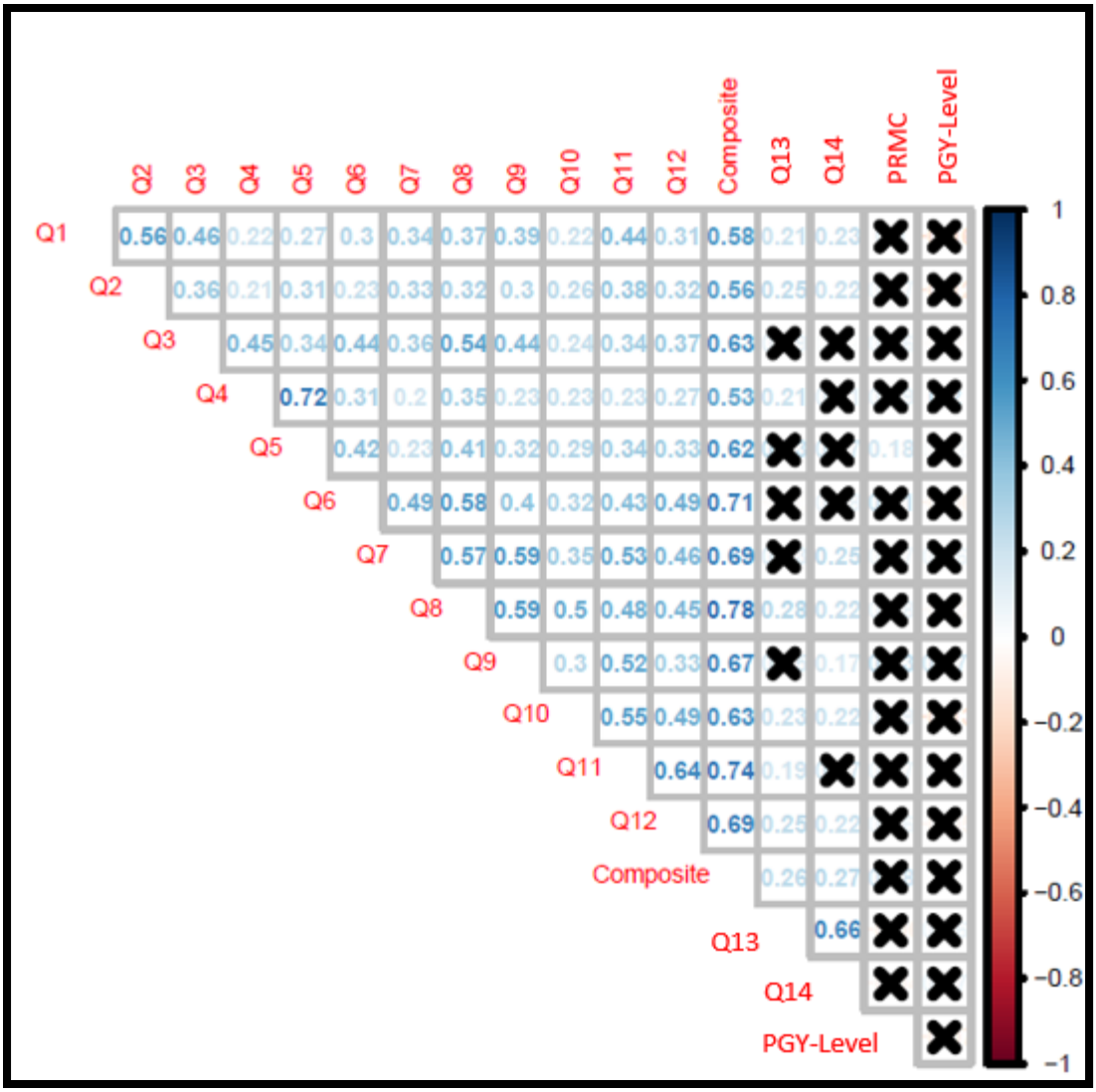


Figure 4.2 Correlation Table: Resident Survey Item Responses

What do fellows believe about how their role modeling influences residents?

Fellow Background

Ninety percent of the fellow respondents reported working with fellows during residency, 8% did not work with fellows during residency, and 2% did not respond to the question. Of the fellow respondents, 94% completed a categorical pediatric residency, 1% emergency medicine residency, 1% child neurology residency, 1% internal medicine-pediatrics residency, and 3% did not disclose this information. Only 21% of fellows reported receiving formal education on how to be a role model, though the timing, content, or context of this education was not specified.

Fellow Perceptions of The Impact of Their Role Modeling

Fellows were not specifically asked if they agreed or disagreed with the statement that fellows serve as role models for residents. However, there were survey items for which "not applicable: I do not believe that fellows serve as role models" was an answer choice. No fellow respondents selected that answer choice when given the option. Fellows were directly asked if they believed fellows served as role models for other fellows. As shown in Figure 4.3, the majority of fellows believe they role model for their peers.

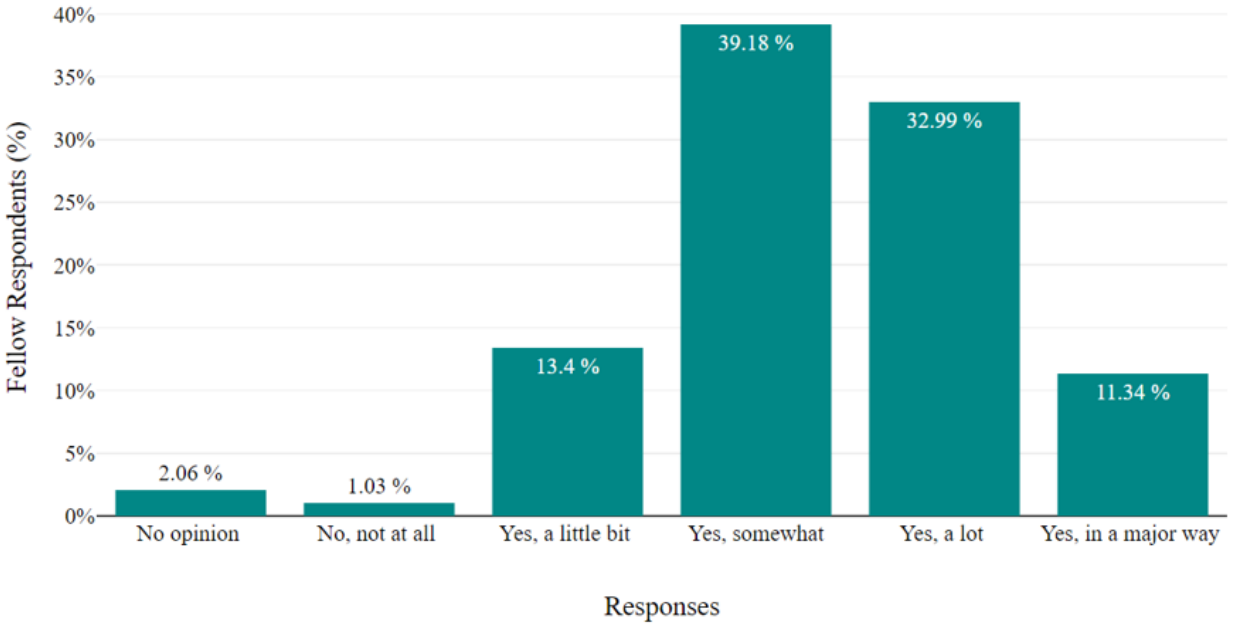


Figure 4.3 Fellow responses to "Do fellows serve as role models for other Fellows?

Figure 4.4 summarizes the fellows' perceptions regarding the magnitude of influence their role modeling had on resident professional development overall, as reflected by the categorization of their composite scores. As shown in Figure 4.4, 60% of fellows believed residents were at least moderately influenced by fellow role modeling. The mean fellow composite score was 3.2 with a standard deviation of 0.72 and median of 3.17. The lowest individual composite score was 1.64 and the highest was 4.83.

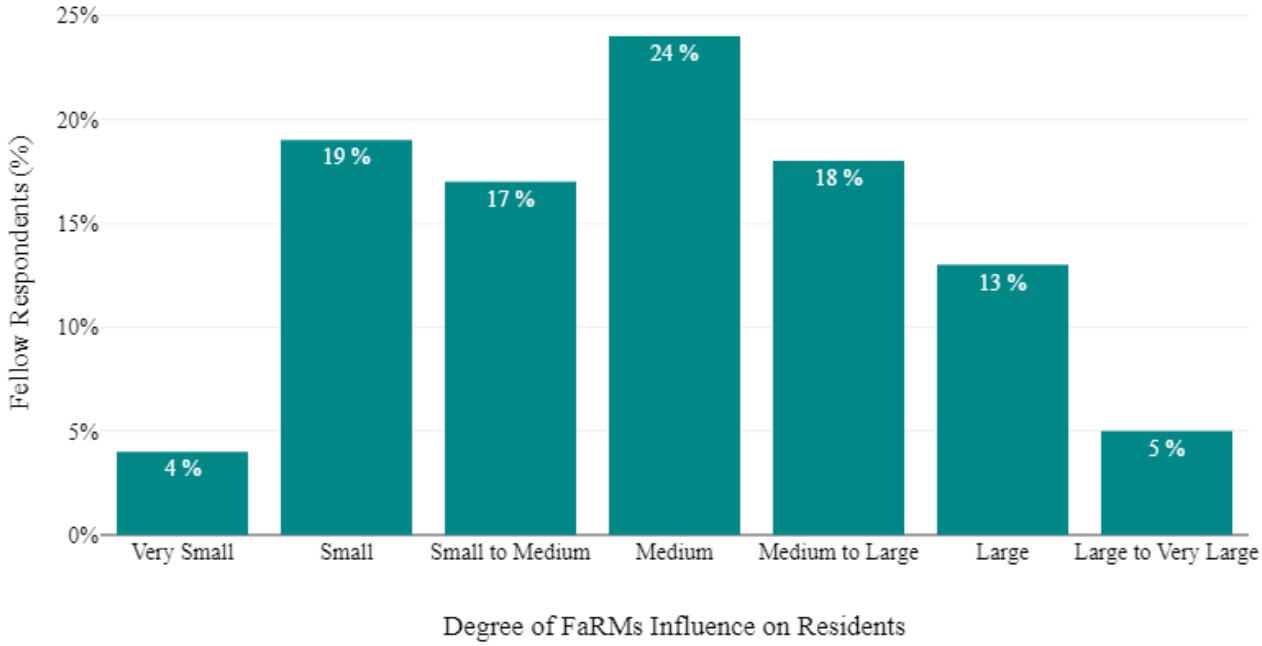


Figure 4.4 Categorization of Fellow Composite Scores Regarding How Impactful Residents' Observation of FaRMs Has Been on Resident Professional Development

Fellow Perceptions of Areas of Resident Development Impacted by FaRMs

Table 4.5 describes the fellow responses to each of the survey items included in the composite score. Of the 12 areas of potential influence included in the survey, "communication with patients", "medical decision-making", and "handling difficult situations" had the highest means and medians and the least amount of variance. Conversely, "teaching methods, "leadership style", and "career goals" had the lowest means.

Table 4.5 Descriptive Analysis of Fellow Responses to Questions 1 through 12

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Composite
Mean	3.57	3.19	3.64	3.32	3.26	3.09	3.14	3.32	3.44	2.72	2.92	2.9	3.2
Median	4	3	4	3	3	3	3	3	4	3	3	3	3.17
Mode	4	4	4	3	3	3	3	4	4	2	3	3	3
SD	0.84	1.06	1	1.1	1.02	1.08	1.08	1.08	1.01	1.05	0.91	0.93	0.72
Variance	0.71	1.13	1.01	1.21	1.04	1.16	1.17	1.16	1.03	1.1	0.82	0.87	0.52
Min	2	1	1	1	1	1	1	1	1	1	1	1	1.64
Max	5	5	5	5	5	5	5	5	5	5	5	5	4.83
Range	3	4	4	4	4	4	4	4	4	4	4	4	3.19

Fellow-Reported Impact of FaRMs on Trainee Wellness

Two survey items addressing indicators of resident burnout and one item related to an indicator of fellow burnout were assessed on the fellow survey. Approximately 59% of fellow respondents reported that they believed their attitudes and actions had either a large or major impact on residents' enthusiasm and engagement at work. Approximately 79% of fellow respondents reported that they believed their attitudes and actions had either a large or major impact on residents' sense of belonging as a valued member of the healthcare team. As shown in Figure 4.5, the majority of fellows reported feeling that they had a positive influence on others at least a few times per week through their work.

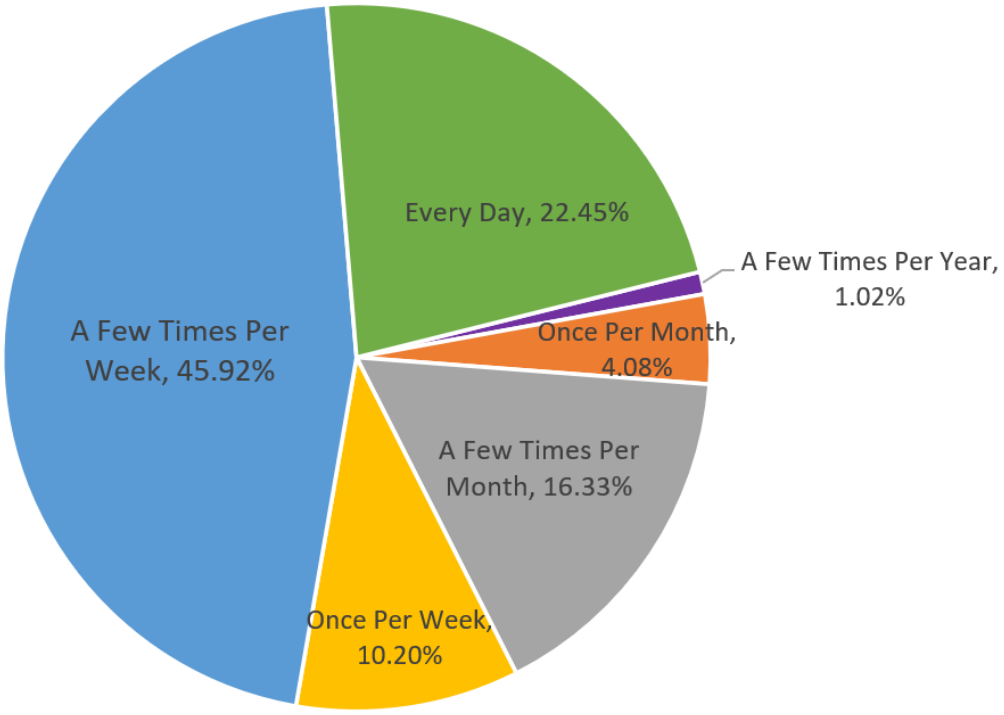


Figure 4.5 Fellows' Reported Frequency of Positive Influence on Others Through Work

What relationships exist between fellow characteristics and their beliefs about the influence of fellow role modeling?

There was no significant association between any survey item response and fellow gender, age, or PGY level. There were not enough fellow respondents who had received role model training to assess for any meaningful response associations. Only 8% of fellow respondents reported *not* being exposed to fellows during their own residency training, so analysis was not performed. Similarly, because only 9% of fellows reported belonging to URiM racial or ethnic groups, analyses comparing URiM and non-URiM fellows were not performed.

Not all fellow subspecialties could be compared due to the small numbers of fellows within certain subspecialties. However, there were 8 pediatric subspecialties with at least 5 fellow respondents each, which allowed for statistical analyses: neonatology (n=12), critical care (n=11), emergency medicine (n=11), hematology/oncology (n=11), neurology (n=7), gastroenterology (n=6), cardiology (n=6), and endocrinology (n=5).

The only area in which these subspecialties differed was in the fellows' perceptions of how influential their role modeling was on the development of residents' clinical exam skills. A Kruskal-Wallis test showed that there was a significant difference between the categories of the independent variable (subspecialty) with respect to the dependent variable "FaRMs influence on residents' clinical exam / procedural skills" ($p=0.016$). Cardiology and neurology fellows reported the highest degrees of perceived FaRMs influence on residents clinical exam / procedural skills relative to the other analyzed subspecialties. There were no significant differences between analyzed subspecialities and fellow responses to other survey items, including composite score, fellow impact on resident wellness, reported degree of role model consciousness, and reported frequency of having a positive influence on others.

Relationships among fellow beliefs about role modeling across different areas of influence

Figure 4.6 displays the Spearman correlation coefficient between each of the 12 areas of potential FaRMs influence (questions 1 through 12), the two resident wellness-related survey items (questions 13 and 14), the "positive influence on others" fellow burnout protection item, fellow composite scores, fellows' reported degree of fellow role model consciousness (RRMC), and fellow PGY level. Correlations which were not statistically significant were crossed out.

All correlations noted were positive, though the strength of the positive correlation varied between different item comparisons. The composite score had a moderate to strong positive association with each of the survey items which comprised the composite score. There were moderate to strong positive associations between certain individual survey items, such as fellow-perceived FaRMs influence on communication with physicians and communication with non-physician healthcare workers.

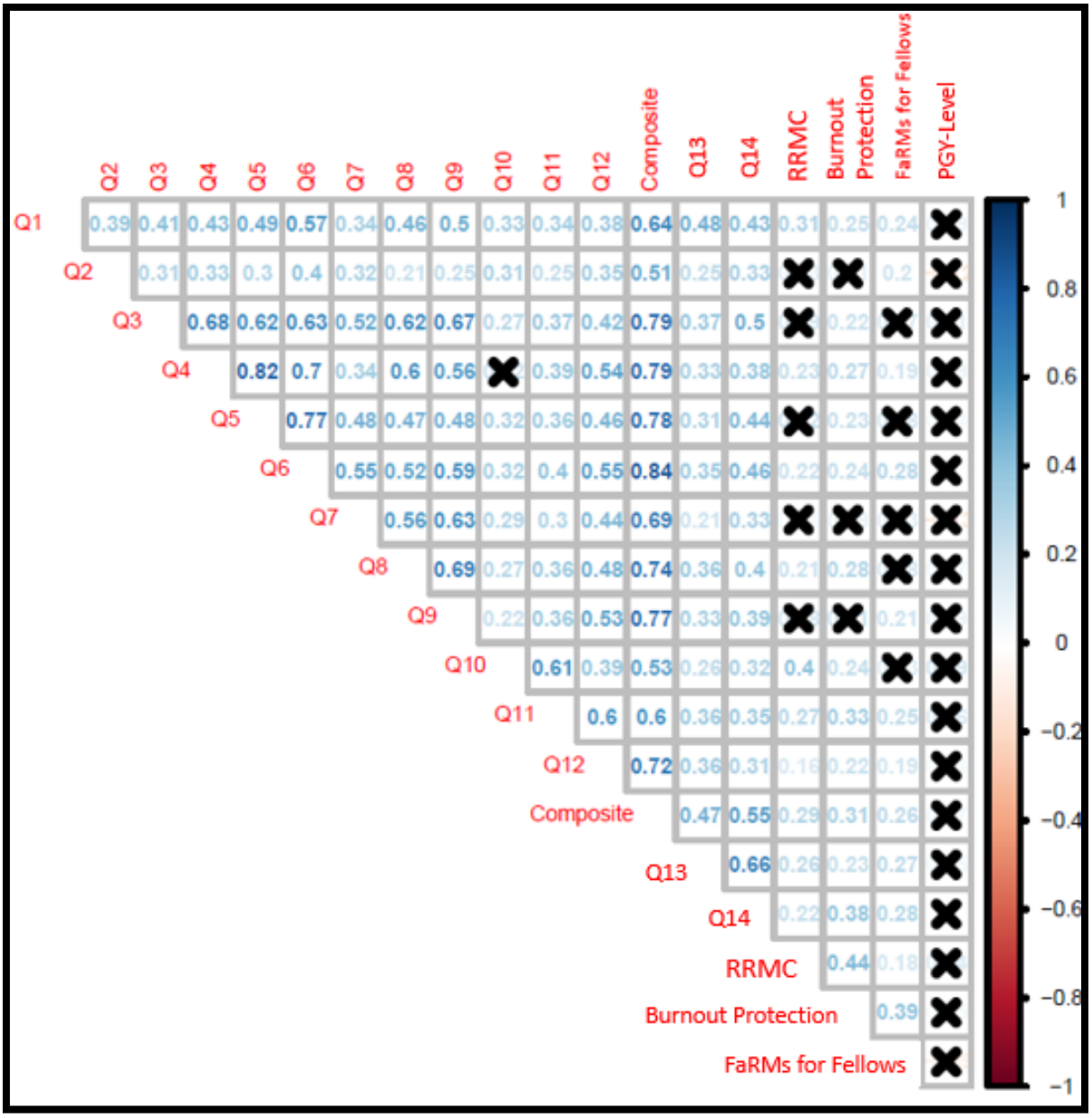


Figure 4.6 Correlation Table for Fellow Survey Item Responses

<u>What relationships exist between fellow characteristics and role model consciousness?</u>

The majority of fellows (62%) reported being "usually aware" of their position as a role model when working with trainees, while 38% reported not being conscious of their role model position during the majority of their resident interactions (Figure 4.7). The relationship between

fellow-reported role model consciousness (RRMC) and other survey item responses was assessed. There was a significant though weak positive correlation between fellows' RRMC and their composite score ($r = 0.29$, $p = 0.004$). There were also weak positive correlations between fellows' RRMC and their perceptions of how impactful their attitudes and actions were on resident enthusiasm / engagement and resident sense of being a valued team member ($p=0.008$ and 0.026, respectively). There was a moderate positive correlation between RRMC and fellow reports of how often they feel they had a positive influence on others through work, which is considered a protective element against fellow burnout ($r = 0.44$, $p = <.001$). This was the strongest correlation between RRMC and another survey item.

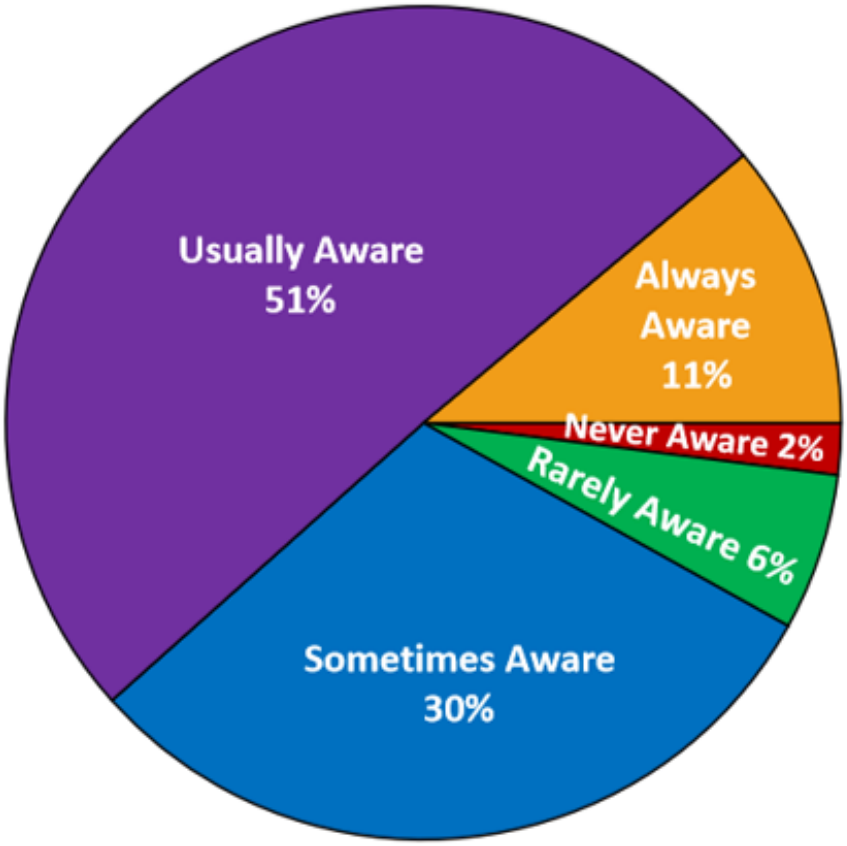


Figure 4.7 Fellow-Reported Frequency of Their Own Role Model Consciousness

What similarities or differences exist between resident and fellow beliefs regarding the influence of fellow role modeling on residents?

FaRMs Influence on Residents' Professional Development

As shown in Table 4.6 and Figure 4.8, residents and fellows had different beliefs about the magnitude of FaRMs influence in certain areas of resident development but similar beliefs in other areas. There were very significant differences between resident and fellow perceptions of how influential FaRMs were in the development of residents' teaching methods and leadership styles. However, residents and fellows both perceived a moderate degree of FaRMs influence in several other areas, such as the development of the residents' ability to handle difficult situations and their development of empathy towards patients.

Figure 4.8 shows the mean resident and fellow responses to each of the first 12 survey items as well as the mean composite scores for each group. Even though the confidence intervals of the mean scores for "medical decision making" and "communication with non-physician healthcare staff" overlap, the differences between the resident and fellow data in these areas were still considered statistically significant. This is because the p-values were calculated using the Wilcoxon rank sum test, which is akin to comparing medians or distributions. Since these measurements were obtained from a Likert-like scale with only 5 ordered possibilities, this was considered the most appropriate method of comparison.

There were also notable differences in which areas of resident professional development were thought to be most and least influenced by residents' observations of fellows' attitudes and actions. These differences are summarized in Table 4.7 below. For example, residents reported "leadership style" as one the most influenced areas while fellows perceived it to be one of the least. Both groups agreed that "career goals" was among the least-influenced areas.

Table 4.6 Comparisons Between Resident and Fellow Perceptions

Residents Report More FaRMs Influence Than Fellows Perceive	Residents and Fellows Report Similar Degree of Perceived FaRMs Influence	Residents Report Less FaRMs Influence Than Fellows Perceive
- Sense of belonging as valued team member *** - Enthusiasm and engagement at work *** - Leadership style **** - Teaching methods **** - Medical decision-making *	- Career goals - Empathy towards patients - Reflective practices - Handling difficult situations - Procedural / Clinical Exam Skills - Communication with patients - Communication with physicians & medical students	- Communication with non-physician staff *** $p < 0.05$ = * $p < 0.01$ = ** $p < 0.001$ = *** $p < 0.0001$ = ****

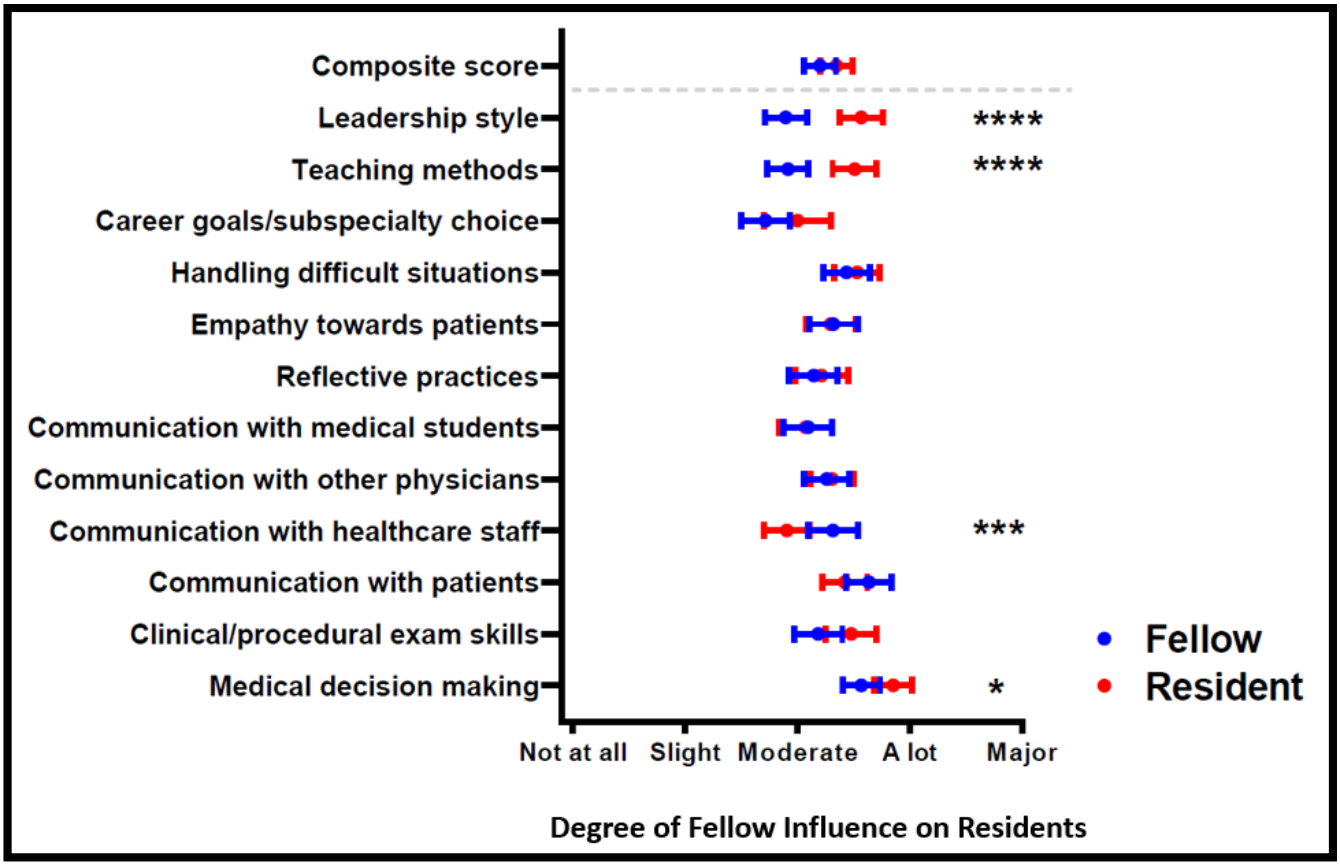
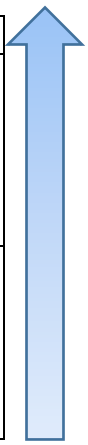


Figure 4.8 Comparisons Between Resident and Fellow Perceptions of FaRMs Influence on Resident Development

Table 4.7 Perceptions of Areas of Highest and Lowest FaRMs Influence

	Resident Responses	Fellow Responses
Areas of Highest FaRMs Influence	• Medical decision-making • Leadership style • Handling difficult situations	• Communication with patients • Medical decision-making • Handling difficult situations
Areas of Lowest FaRMs Influence	• Communication with students • Career goals • Communication with non-physician staff	• Teaching methods • Leadership style • Career goals



Trainee Perceptions of Fellow Role Model Consciousness

There was a significant difference between the level of role model consciousness reported by the fellows and the degree of fellow role model consciousness estimated by the residents. The mean and median responses to the survey item explicitly addressing role model consciousness were compared in Figure 4.9. Fellows reported they were more conscious of their role model position than residents perceived them to be and these differences in perception were statistically significant. Approximately 40% of residents believed that fellows were either “usually aware” or “always aware” of their role model position, compared to 62% of fellows who reported being either “usually aware” or “always aware” of their role model position when interacting with residents.

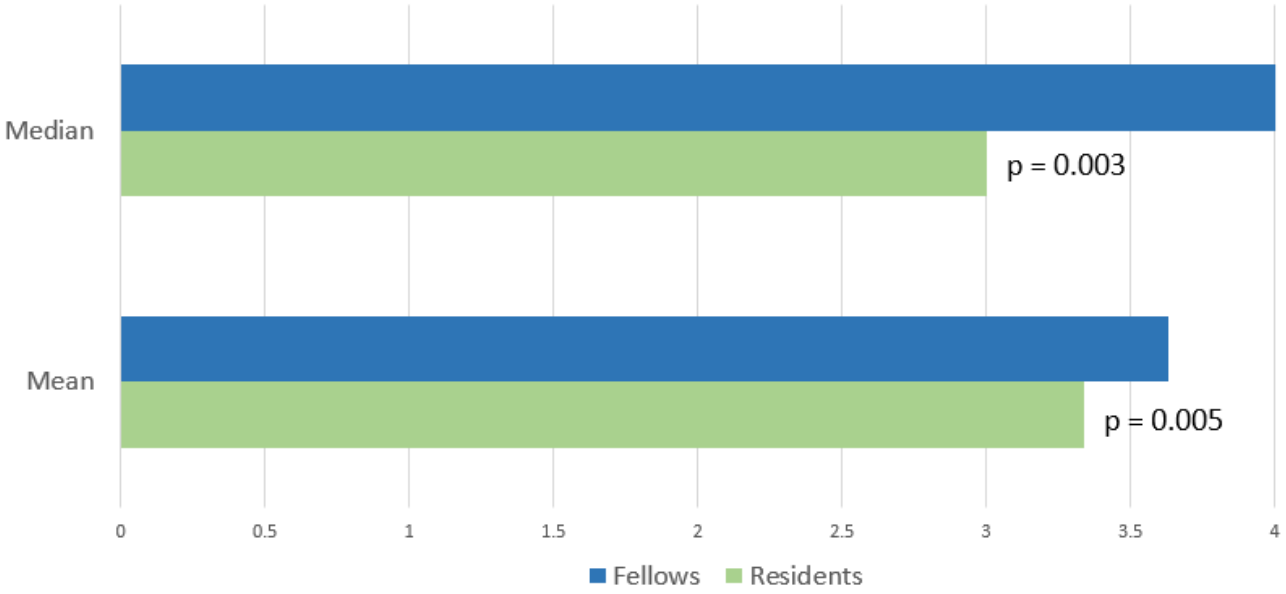


Figure 4.9 Residents and Fellows Differed in Their Perception of Fellow Role Model Consciousness

Comparing Perceptions of FaRMs Impact on Resident Wellness

Figures 4.10 and 4.11 compare resident and fellow responses to questions about fellow impact on items related to resident wellness. A Mann-Whitney U-Test showed that the difference between resident and fellow perceptions about the impact of fellows' behaviors and attitudes on resident enthusiasm and engagement at work was statistically significant ($p=<0.001$). The same analysis showed similar results when comparing resident and fellow perceptions about the impact of fellows' behaviors and attitudes on residents' sense of belonging as a valued member of the healthcare team ($p=0.0002$). In both areas, residents reported that fellows had a larger impact than the fellows themselves perceived.

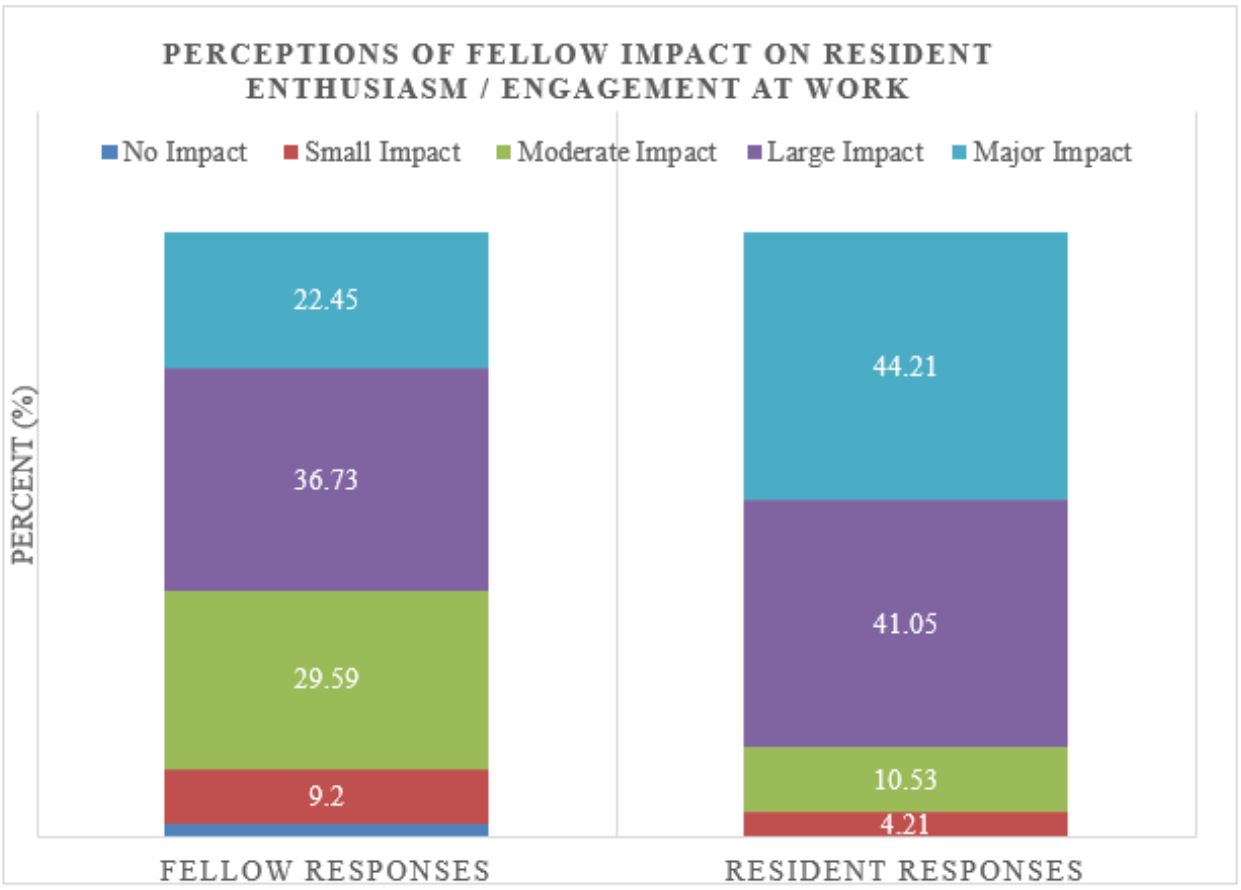


Figure 4.10 Fellow Impact on Resident Enthusiasm

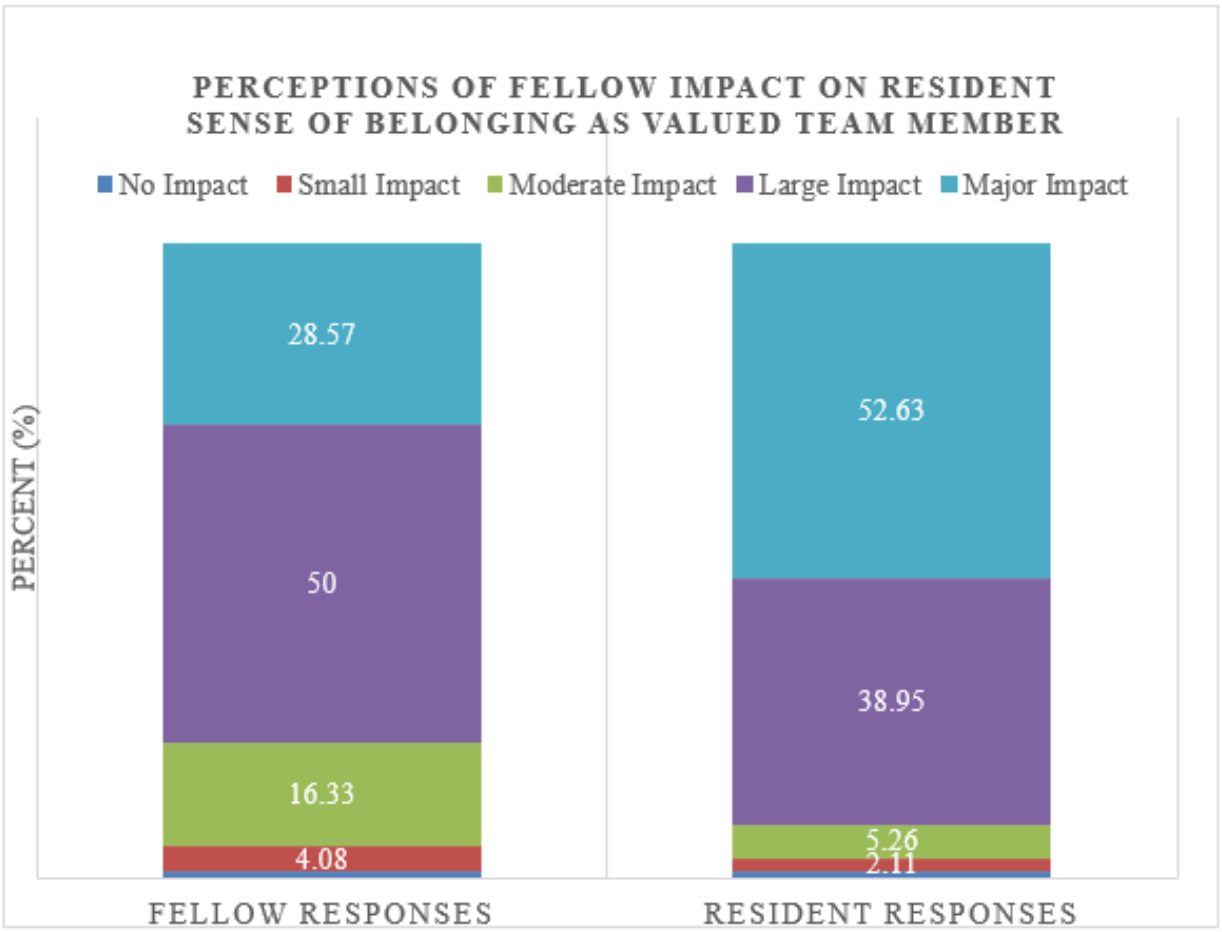


Figure 4.11 Fellow Impact on Resident Belonging

Summary

Both fellows and residents indicated that they believe fellows function as role models for residents. Most residents and fellows reported that residents were at least moderately influenced in multiple areas of their professional development by observing the attitudes and actions of fellows. The degree of perceived influence reported by both groups varied in different areas of resident professional development. Residents and fellows had similar beliefs about the degree of fellow influence in some areas but differed in others. Residents reported a higher degree of influence by FaRMs than fellows perceived in the development of residents' medical decision-

making, teaching methods, and leadership styles. Most fellows reported being conscious of their position as a role model when interacting with residents at least some of the time, though the frequency of that awareness varied between fellows. Data suggest that fellows' behavior and attitudes had a significant impact on resident enthusiasm and engagement at work on residents' sense of belonging to the healthcare team. Fellows with higher degrees of self-reported role model consciousness scored higher on a burnout protection indicator. Detailed discussion of these results will follow in the next chapter.

Chapter 5: Discussion

Overview

In this final chapter, the study will be summarized and the study findings discussed. The data suggest that most fellows are aware of their role model position, but may not be fully aware of the impact their observed attitudes / actions can have on residents' professional development and wellbeing. The study conclusions will be presented in the context of the study's strengths and limitations. This chapter will conclude with considerations for applications of the knowledge gained from this study, including possible future avenues of related study about fellows as role models (FaRMs).

Study Summary

A role model is a person whose behaviors and/or attitudes are observed and emulated by others. Observing and participating in role modeling is critical for the education and professional identity formation of trainees. Role model consciousness enhances the quality and efficacy of role modeling as an educational tool. Role modeling benefits both the model and the observer. Fellows are presumed to function as role models for residents, but little is known about how residents are influenced by fellow role modeling or about what residents / fellows believe about this influence. If fellows are appropriately aware of the impact their modeling has on residents' education / development, then they can maximize this educational method for residents while also enriching their own professional identity formation. Without a better understanding of the

FaRMS phenomenon, there can be no evidence-based supports in place to foster role model consciousness or role modeling skills.

The purpose of this prospective exploratory survey-based cross-sectional study was to discover and compare what pediatric residents and pediatric subspeciality fellows believe about the impact of fellow role modeling on residents' professional development and wellbeing at a large freestanding children's hospital in the Midwest.

Research Questions

1. *What do residents believe about how they are influenced by exposure to fellow role modeling?*

    1A. *What relationships exist between resident characteristics and their beliefs about the influence of fellow role modeling?*

2. *What do fellows believe about how their role modeling influences residents?*

    2A. *What relationships exist between fellow characteristics and their beliefs about the influence of fellow role modeling?*

    2B. *What relationships exist between fellow characteristics and role model consciousness?*

3. *What similarities and differences exist between resident and fellow beliefs about the influence of fellow role modeling on residents?*

To address these research questions, resident and fellow questionnaires consisting primarily of 5-point Likert-like scale items were developed and distributed to all eligible residents and fellows at the study institution. The survey response rate was adequate to provide a representative sample and to power the study to detect at least moderate differences between groups. The data were analyzed first using descriptive statistics. Then, aggregate data for

residents and fellows were compared using nonparametric tests. Correlational analyses were also used to assess the relationships between different variables.

Summary of Findings

The premise of the study – that fellows function as role models for residents – was confirmed. All resident and fellow respondents indicated that they agreed with this premise. The assumption that most fellows have not received any formal education about role modeling was also confirmed.

1. What do residents believe about how they are influenced by exposure to fellow role modeling?

- The majority (73%) of residents believed they were at least moderately influenced by fellow role modeling overall.
- Residents reported that "medical decision making", "leadership style", and "handling difficult situations" were the areas of their professional development most heavily-influenced by fellow role modeling.
- Residents reported that "communication with non-physician healthcare workers", "career choices", and "communication with medical students" were the areas of their professional development least-influenced by fellow role modeling.
- Most residents residents reported that fellow actions and attitudes have a significant impact on two areas related to wellness and burnout: their enthusiasm and engagement at work (85%) and their sense of belonging as a valued member of the healthcare team (92%).

1A. What relationships exist between resident characteristics and beliefs about the influence of fellow role modeling?

- Beliefs about the influence of FaRMS did not differ with PGY level, gender, or age.
- Residents who intended to pursue sub-specialization reported higher degree of FaRMs influence on career goals compared with residents who do not plan to subspecialize. Beliefs about FaRMs influence in other areas of professional development did not differ based on resident intent to subspecialize.
- Pilot data suggest there may be differences in the perceived degree of FaRMs influence for certain areas of resident development when comparing URiM groups and non-URiM groups, but a larger study is needed to confirm these differences.

2. What do fellows believe about how their role modeling influences residents?

- 60% of fellows believed that their role modeling had at least a moderate influence on residents' professional development overall.
- Fellows believed the areas of residents' professional development most influenced by fellow role modeling were: "communication with patients", "medical decision-making", and "handling difficult situations".
- Fellows believed the areas of residents' professional development least influenced by fellow role modeling were: "teaching methods, "leadership style", and "career goals".
- Most fellows believed that their actions and attitudes have a significant impact on two areas related to resident wellness: resident enthusiasm and engagement at work

(59%), and residents' sense of belonging as a valued member of the healthcare team (79%).

- 62% of fellows reported being consciously aware of their position as a role model the majority of the time when working with residents, while 38% reported not typically being conscious of their role model position.

2A. What relationships exist between fellow characteristics and their beliefs about the influence of fellow role modeling?

- Beliefs about the influence of fellow role modeling did not differ based on any of the following: PGY level, gender, or age.
- Fellow beliefs about FaRMs influence on the development of residents' clinical exam skills differed between some subspecialties.

2B. What relationships exist between fellow characteristics and role model consciousness (RMC)?

- Fellows who reported a higher level of RMC perceived their influence on residents to be greater than those who reported a lower level of RMC.
- There was a moderate positive correlation between fellow-reported RMC and their perception that they had a positive impact on others through their work, which is a protective factor against burnout.

3. What similarities and differences exist between resident and fellow beliefs about the influence of fellow role modeling on residents?

- Overall influence: Composite scores did not significantly differ between residents and fellows, suggesting trainees generally believe fellow role modeling has at least a moderate degree of influence on residents' professional development.

- Areas of agreement:
  - "Career choices" was one of the areas of residents' professional development least influenced by exposure to fellow role modeling.
  - "Medical decision-making" and "handling difficult situations" were among the most heavily-influenced areas of residents' professional development.
  - FaRMs had a moderate degree of influence on resident development in the following areas: Empathy towards patients, Reflective practices, Handling difficult situations, Procedural / Clinical Exam Skills, Communication with patients, Communication with physicians & medical students.
  - Areas of discordance:
    - Fellows perceived themselves to be more influential in the development of residents' ability to communicate with non-physician staff than residents reported.
    - Fellows perceived themselves to be less influential in the development of residents' medical decision-making skills, teaching methods, and leadership skills than residents reported.
    - Fellows perceived themselves to be less impactful on resident wellness than residents reported.
    - Fellows reported possessing more RMC than residents perceived.

Discussion

Interpretation of Study Findings

The data strongly suggest that theory fits practice within the fellow-resident role modeling context. That is, residents are indeed influenced by witnessing the behaviors and attitudes modeled by fellows. Both groups of trainees reported, on average, that residents' observations of fellow modeling had at least a moderate degree of influence on their empathy towards patients, reflective practices, ability to handle difficult situations, their procedural / clinical exam skills, and their communication with patients, medical students, and physicians. Both groups reported that the most heavily-influenced areas included medical decision making and handling difficult situations. This tacit agreement between both groups that fellow role modeling is important for residents' development in these areas supports the idea that trainees are aware, at least in retrospect, that learning via fellow role modeling occurs. This also supports the concept that resident exposure to fellows can aid in resident education and professional development. The finding that residents who intend to subspecialize and residents who do not intend to subspecialize did not differ in their reported degree of FaRMs influence in nearly all areas in this study indicates that fellow role modeling is an important educational tool for all residents, not just those who plan to pursue fellowship training themselves.

Though there were many areas of agreement, beliefs varied between groups regarding the degree to which certain areas of residents' professional development were influenced. In some areas, residents believed FaRMs influence to be greater than fellows perceived, indicating that fellows may have underestimated or underreported their influence. Alternatively, residents may have overestimated or overreported the degree to which they are influenced by fellow modeling.

The latter seems less likely but would be difficult to determine objectively. These areas of discordance included some important aspects of professional development, such as medical decision-making skills, leadership style, teaching methods, and resident wellness.

The only area in which fellows perceived themselves to be more influential than residents reported was in the development of residents' ability to communicate with non-physician staff. Based on comments made during the piloting of the questionnaire with trainees, one could speculate that this difference may arise from a resident perception that there is a different power dynamic between fellows and nurses that makes the modeled behavior seem less applicable for the residents. This would be an interesting area to investigate with qualitative interviews.

Fellows reported being more conscious of their role model position than residents perceived them to be, which could indicate fellows are not being very explicit in their modeling or that residents are not adequately perceptive. It could also mean that fellows are modeling objectionable behavior and thus the residents assume they must not be conscious of their role model status. Fellows could perhaps be aware but lack the skills to translate that awareness effectively or may be too preoccupied with other tasks to make role modeling a priority.

The positive correlation between fellow-reported RMC and a protective factor against fellow burnout is an interesting finding that warrants further study. Positive role modeling does not depend on the role model performing perfectly in front of learners. In fact, openly reflecting on mistakes or uncertainty is an important habit to model for trainees. However, if a fellow felt pressure to "perform" a certain way as a result of their increased RMC, then one could argue that it could contribute to fellow burnout. Alternatively, as may be the case in this study population,

one could argue that increased RMC furthers one's sense of purpose and thus fosters resilience and collegiality.

Fellow attitude and actions had a significant impact on areas affecting resident wellness. Residents reported a greater impact than fellows perceived. Though most fellows report some degree of role model consciousness during interactions with trainees, they may not be fully aware of just how impactful their attitudes and actions, as observed by residents, can be on residents' professional development and wellbeing.

Comparison with Existing Literature

Though the specific topic of fellow role modeling's influence on residents is virtually unexplored in the literature, the importance of role modeling in medical education in general is well-established.[28,41,60,62] This data supports the evidence-based premise that role modeling is a vital part of medical education for trainees.

Data from this study suggest that the professional development areas in which residents are influenced by attending physician role modeling are similar to those influenced by fellow role modeling, though additional studies are needed to determine if the magnitude and scope of said influence may be different in the fellow-resident dyad as compared to the attending-resident or attending-medical student dyads reported in the literature. Clinical reasoning (i.e., medical decision-making) was reported as one of the most influenced areas in this study, which corresponds with the importance of clinical reasoning skills cited in studies of attending role modeling.[71] Residents in this study reported that "career goals" was one of the areas least-influenced by fellows, which suggests that influence in this area of resident development may be less pronounced in the fellow-resident dyad than in others reported in the literature.[25,42]

Though fellow role model consciousness is underexplored in the literature, the data from this study suggest a phenomenon somewhat similar to one described in a study about resident role model consciousness. The data from the resident study suggested that residents understood that learning occurred from near-peer role modeling but that residents were not always aware of their positions as role models in real-time.[39]

Limitations

The most obvious study limitation was that the lack of prior research on the specific topic limited study design options, with an exploratory study design being the most appropriate design type. Exploratory design has inherent limitations in the conclusiveness and generalizability of the study findings. Due to time constraints and funding limits, this study was also only conducted at a single institution at a single point in time, thus further limiting its generalizability. If time and funding constraints had not been present, a mixed methods study design would have been chosen in order to provide a richer set of data for this underexplored topic. Because of the novelty of the topic, it was not possible to fully assess the survey instrument's internal validity or reliability without creating a considerably longer questionnaire. A longer questionnaire would have likely diminished the response rate.

There may have also been response bias with regard to resident intent to subspecialize. Approximately 77% of resident respondents indicated they planned to subspecialize after residency, which is more than typical residency classes have reported in the past. According to the study institution's website, roughly 68% of categorical pediatric residency graduates over the last three years have chosen to subspecialize.[101] This includes the pediatrics-genetics and child neurology residency graduates, as is included in our study population. It is possible that residents

interested in fellowship were more interested in completing a survey about fellow role modeling. This study also relied on self-reported data, which is subject to bias.

There were logistical and technical limitations as well. The study was conducted in Fall 2021. Thus, interns and first year fellows, who account for nearly a third of the study population, had only been in their respective roles for three months and may not have had adequate exposure to one another to form strong opinions about the impact of fellow role modeling. A technical malfunction resulted in respondents being able to submit the survey without answering Q13 and Q14. Another technical malfunction resulted in many respondents not realizing they were asked to enter their age. The option to answer "no opinion" to Q1-12 questions also limited the way in which the data could be quantified and analyzed.

Strengths

The greatest strength of this study was the response rate. Not only did this allow for adequate power to assess relationships between variables, but it increased the likelihood of adequate population representation. Indeed, study participants generally seemed to reflect the demographic characteristics of the population as a whole. The review of the questionnaires by both a panel of medical education experts and a pilot group of trainees established content validity and response process validity, which are particularly important in an exploratory study. Another strength of this study was that its quantitative design allowed for statistically-supported comparisons and the precision of the survey items allowed those comparisons to be meaningful.

Conclusions

Prior to this study, there was nothing known about the influence of pediatric subspecialty fellow role modeling on pediatric residents. This study answers important questions about the

influence of FaRMs on residents at the specific study institution and lays the groundwork for future studies. Pediatric residents and pediatric subspecialty fellows at this large freestanding Midwestern children's hospital believe that fellow role modeling was influential in the residents' professional development. There are similarities and differences between resident and fellow beliefs regarding the scope and magnitude of this influence.

Both residents and fellows agree that resident exposure to fellow role modeling had a significant influence on the residents' medical decision-making skills and on their ability to successfully handle difficult situations, though residents perceived a stronger influence on their medical decision-making skills than the fellows perceived. The attitude and behaviors of fellows as witnessed by residents also impacted key areas of resident wellness. Even though most fellows are usually aware of their position as role models, they may not be fully aware of how their observed attitudes or actions impact residents' professional development and wellbeing. There are currently no formalized educational tools to intentionally improve fellow role modeling at this study institution. Increasing role model consciousness amongst fellows has the potential to improve role modeling behaviors and, as data from this study suggest, may improve resident and fellow wellness.

Recommendations and Future Directions

This study deepens the understanding of near-peer role modeling at the study institution. Publicizing the results of this study at the study institution is recommended, as it has the potential to raise awareness of how influential the residents' observation of fellows behaviors and attitudes can be on their professional development. As an exploratory study, this study provides equipoise about the influence of fellow role modeling on residents and about the degree

of role model consciousness possessed by fellows. There is strong enough data to reasonably suggest that certain hypotheses about the topic may be true but there is not enough evidence to confirm their truth. Therefore, it could serve as either a pilot study for a similar but larger project or provide a reasonable basis for hypothesis-driven research. A multi-institution study, perhaps through ACGME, would provide a much more powerful dataset with generalizable conclusions. Repeating the questionnaire with the same cohort at different time points as part of a longitudinal study could provide information about how (or if) perceptions of role modeling influence change over time. Adding a qualitative interview component to the quantitative component of this study, along with some direct observation of fellows interacting with resident trainees, could provide much richer data as well.

This exploratory study has generated several questions worthy of follow-up. For example, will publicizing the results of this study alone have any impact on the role model consciousness or role modeling behaviors of the fellows at the study institution? Is increased role model consciousness truly a protective factor when it comes to trainee burnout? It would also be interesting to compare how influential fellow role modeling is in residents' professional development compared to other education avenues such as formal residency curriculum and exposure to attending physician role modeling. Qualitative longitudinal studies could be performed to further explore how residents decide which modeled behavior / attitude to emulate and to further explore near-peer role modeling's relationship to self-efficacy.

Finally, if larger studies confirm this study's assertion that residents are influenced in important ways via observation of fellow role modeling, the next logical step would be to develop a validated tool to assess fellow role model consciousness and skills. Only then can an

evidence-based intervention to support fellow development in these areas be established and assessed. Ultimately, it would be ideal to be able to study the impact those interventions have on other variables, like resident and fellow burnout or patient outcomes. It is clear that there are numerous opportunities to further study the importance and impact of fellows as role models for residents.

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Appendix A. Questionnaires

Resident Survey

For questions 1 through 12: On a scale of 1 to 5, with 1 being "no influence" 5 being "major influence", rate to what degree your observations of fellows' attitudes and actions (both positive and negative) have influenced your development in the following areas. Please note: you are not rating the quality of their influence (i.e., good or bad), just the magnitude (i.e., no influence to major influence).

No opinion	1 (no influence)	2 (slight influence)	3 (moderate influence)	4 (a lot of influence)	5 (major influence)

Examples:
- If watching / working with fellows has heavily influenced the development of your medical decision-making skills, you would choose 5 for question #1.
- If the statement "Watching how fellows communicate with patients has only slightly influenced how I communicate with patients" is true for you, then you would answer 2 to question #3.

1. **Medical decision making**
2. **Procedural or clinical exam skills**
3. **Communication / interaction with patients and their families**
4. **Communication / interaction with non-physician healthcare workers**
5. **Communication / interaction with other physicians**
6. **Communication / interaction with medical students**
7. **Reflective practices (ex// debriefing; seeking and applying feedback; discussing mistakes; discussing the personal impact of difficult cases, etc.)**
8. **Empathy towards patients / families**
9. **Handling difficult situations (challenging patient scenarios, interpersonal conflict)**
10. **Career goals / choice of subspecialty**
11. **Teaching methods**
12. **Leadership style**

13. To what degree do fellows' attitudes and actions impact your enthusiasm / engagement at work?

No Impact	Slight impact	Moderate impact	Large impact	Major impact

14. To what degree do fellows' attitudes and actions impact your sense of belonging as a valued member of the healthcare team?

No Impact	Slight impact	Moderate impact	Large impact	Major impact

15. I can think of at least one fellow who has demonstrated an attitude, behavior, or skill that I have subsequently tried to emulate in my own work.

Yes, I agree	No, I disagree

16. How often are fellows consciously aware of their position as role models?

N/A: I don't think fellows are in the position of role model	No opinion or I don't know	Never aware	Rarely aware	Sometimes aware	Usually aware	Always aware

17. Do you plan to pursue fellowship training after residency?

Yes	No

18. If "yes" to question #17, which subspecialty? (n/a if no) _____

19. What is your current level of training?

PGY-1	PGY-2	PGY-3	PGY-4

20. What is your residency program?

Categorical Pediatrics	Child Neurology	Peds-Genetics

<u>Demographic Information</u>

We are collecting data about gender and ethnicity with a distinct study purpose (to note any differences in role modeling perceptions in trainees who groups historically underrepresented in medicine). Providing this information is optional. If you choose to enter your name or contact information at the end of the survey, your demographic information will be known to the study author but will only be used as part of aggregate data.

21. What is your gender?

Male	Female	Transgender	Non-Binary	Prefer not to disclose

22. What is your race? Choose *all* that apply.

□ **American Indian or Alaskan Native**

□ **Asian or Asian American**

□ **Black or African American**
□ **Caucasian (white)**
□ **Native Hawaiian or other Pacific Islander**
□ **Other, not listed**
□ **Prefer not to disclose**

23. What is your ethnicity?
□ **Hispanic or Latino**
□ **Middle Eastern or North African**
□ **Neither Hispanic / Latino nor North African / Middle Eastern**
□ **Prefer not to disclose**

24. What is your age? _____

Fellow Survey

For questions 1 through 12: On a scale of 1 to 5, with 1 being "no influence" and 5 being "major influence", rate to what degree you believe residents' observations of your attitudes and actions (both positive and negative) influence interns/residents' development in the following areas. Please note: you are not rating the quality of your influence (i.e. good or bad) on residents but rather the magnitude (i.e. no influence to major influence).

No opinion	1 (no influence)	2 (slight influence)	3 (moderate influence)	4 (a lot of influence)	5 (major influence)

Examples:
- If you think watching / working with you has heavily influenced the development of residents' medical decision-making skills, you will choose 5 for question #1.
- If the statement "Watching how I communicate with patients has only slightly influenced how interns/residents communicate with patients" is true for you, then you would answer 2 to question #3.

1. **Medical decision making**
2. **Procedural or clinical exam skills**
3. **Communication / interaction with patients and their families**
4. **Communication / interaction with non-physician healthcare workers**
5. **Communication / interaction with other physicians**
6. **Communication / interaction with medical students**

7. **Reflective practices (ex// debriefing; seeking and applying feedback; discussing mistakes; discussing the personal impact of difficult cases, etc.)**
8. **Empathy towards patients / families**
9. **Handling difficult situations (challenging patient scenarios, interpersonal conflict)**
10. **Career goals / choice of subspecialty**
11. **Teaching methods**
12. **Leadership style**

13. To what degree do your attitudes and actions impact interns' and residents' enthusiasm / engagement at work?

No Impact	Slight impact	Moderate impact	Large impact	Major impact

14. To what degree do fellows' attitudes and actions impact your sense of belonging as a valued member of the healthcare team?

No Impact	Slight impact	Moderate impact	Large impact	Major impact

15. Did you work with fellows when you were a resident?

Yes	No

16. When interacting with trainees, how often are you aware that you are in the position of role model?

N/A: I don't think fellows are in the position of role model	No opinion or I don't know	Never aware	Rarely aware	Sometimes aware	Usually aware	Always aware

17. Have you ever received formal training on how to be a role model?

Yes	No

18. Through my work, I feel I have a positive influence on people …

□ **Never**
□ **A few times per year**
□ **Once a month**
□ **A few times per month**
□ **Once a week**
□ **A few times per week**
□ **Every day**

19. Do you think fellows serve as role models for other fellows?

No opinion	No, not at all	Yes, a little bit	Yes, somewhat	Yes, a lot	Yes, in a major way

20. What is your current level of training?

PGY-4	PGY-5	PGY-6	PGY-7 or higher

21. What is your subspeciality? _____

22. What residency program did you complete?

- □ **Categorical Pediatrics**
- □ **Internal Medicine-Pediatrics**
- □ **Child Neuro**
- □ **Emergency Medicine**
- □ **Other**

<u>Demographic Information</u>

We are collecting data about gender and ethnicity with a distinct study purpose (to note any differences in role modeling perceptions in trainees who groups historically underrepresented in medicine). Providing this information is optional. If you choose to enter your name or contact information at the end of the survey, your demographic information will be known to the study author but will only be used as part of aggregate data.

23. What is your gender?

Male	Female	Transgender	Non-Binary	Prefer not to disclose

24. What is your race? Choose *all* that apply.

- □ **American Indian or Alaskan Native**
- □ **Asian or Asian American**
- □ **Black or African American**
- □ **Caucasian (white)**
- □ **Native Hawaiian or other Pacific Islander**
- □ **Other, not listed**
- □ **Prefer not to disclose**

25. What is your ethnicity?

- □ **Hispanic or Latino**
- □ **Middle Eastern or North African**
- □ **Neither Hispanic / Latino nor North African / Middle Eastern**
- □ **Prefer not to disclose**

26. What is your age? _____