Three-Year Family Medicine Residency Program Use of the ACGME Core Competencies to

Assess Physician Competency: A Scoping Review

Submitted by

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ABSTRACT

Poor patient satisfaction during care has been linked to the inadequate evaluation of resident knowledge during residency training programs. The Accreditation Council for Graduate Medicine Education (ACGME) set guidelines for resident education in the accredited medical training programs, that describes the required areas in which a resident must indicate competence in order to be deemed capable of autonomous practice, termed the ACGME Core Competencies. To evaluate the usefulness of the ACGME Core Competencies in terms of resident competence, I completed a literary synthesis in the form of a scoping review. This review aims to examine the extant literature on the tools utilized in the evaluation of family medicine resident performance during residency. The results indicated that direct observation is most commonly used to evaluate resident competency, while multisource evaluations, including the use of peer reviews and patients, provided constructive feedback and demonstrated improvements in resident performance and patient care satisfaction. A standardized evaluation tool for resident performance during residency training is needed to successfully analyze resident capabilities, as all residents should be held to the same assessment standards. Further research may reveal what multisource assessment methods should be recommended for the standardized assessment of resident competence during training nationwide.

INTRODUCTION

   To become a practicing physician, medical students must first complete a residency training program in a specialty area, followed by a board certification exam in which a passing result allows a resident to practice as an autonomous physician. One area in which residents can specialize is family medicine – the comprehensive, continual care for individuals and families across all ages, and medical conditions (Doubeni, Davis, Benson, & Ewigman, 2017). The Accreditation Council for Graduate Medicine Education (ACGME) set guidelines and standards for resident education and performance in the accredited medical training programs across the globe (Mainiero & Lourenco, 2011). These set guidelines for resident training and education are defined in terms of six subject areas, called the ACGME core competencies. The six ACGME core competencies are concepts that physicians must practice and achieve in the changing healthcare environment, that act as the basis for the educational and clinical training framework to their residency program (Mainiero & Lourenco, 2011).

   The core competencies for the family medicine residency training program outlined by the Accreditation Council are: medical knowledge, patient care, practice-based learning and improvement, professionalism, interpersonal and communication skills, and systems-based practices (Mainiero & Lourenco, 2011). These competency areas were implemented to ensure that all education and training protocols utilized by accredited residency programs result in the creation of competent, autonomous practicing physicians. Residency programs that fail to meet core competencies set by the ACGME result in the poorly trained physicians that cannot adequately practice or provide safe health care for their patients (Mainiero & Lourenco, 2011).

   A critical connection exists between resident performance on the American Board of Family Medicine Certification Examination, prior to being deemed as autonomous practitioners,

and competency measurements utilized during their resident education and training. A recent

study was conducted utilizing a retrospective cohort study from 2007 to 2011, to assess the

association between residency performance on the American Board of Family Medicine

Certification Examination (ABMF CE) and the two set ACGME examination performance

standards (Falcone & Middleton, 2013). This study aimed to evaluate the performance for

examinee's first attempt of the ABFM certification exam in family medicine residency programs

in both the United States and Puerto Rico, in terms of the ACGME examination standards.

ABFM CE scores below the 25th percentile, and programs with greater than a 10% fail rate for

examinee's first attempts, over a three- and five-year period, represent poor performance of the

residency training program in accordance with the two ACGME set examination standards

(Falcone & Middleton, 2013). A total of 429 residency programs met the inclusion criteria for

this study. Of those 429 programs, 244 family medicine residency programs (56.9%) had a first-

time examinee fail rate greater than 10% over the 5 years (Falcone & Middleton, 2013).

Additionally, a total of 107 family medicine residency programs out of the 429 (24.9%) had

composite program scores that were equivalent to or below the 25th percentile for the ACGME

standards.

The results of this study indicate that approximately half of the accredited family

medicine residency programs are at risk of failing the ACGME examination guidelines as they

reported ABFM CE pass rates below 90% (Falcone & Middleton, 2013). The ACGME has a set

pass rate standard for first-time examinees for the family medicine specialty of scores 90% or

above, while internal medicine and pediatrics have pass rates of 80% and 60%, respectively

(Falcone & Middleton, 2013). The 429 family medicine residencies studied in this evaluation

reported pass rates ranging from 80.0% to 94.3%, with a median pass rate of 88.2%, reporting

below the ACGME examination standard by 1.2% (Falcone & Middleton, 2013). The high

portion of accredited family medicine programs that do not meet the two ACGME examination

standards highlight recent concern of poor resident performance and competence. This study is

indicative of sub-par results and inefficiency in the current educational methodologies and

clinical training protocols utilized in the education and preparation of future autonomous

physicians.

Currently, there is no standard tool or method used to evaluate individual physician

competence based on knowledge and clinical application during the residency training period

(Mainiero & Lourenco, 2011). This review aims to describe the ACGME Core Competencies

and guidelines set for family medicine residents, to examine and describe the extant literature on

the current tools and practices utilized in evaluation of family medicine resident performance and

competence relating to the six core competencies set by the ACGME. Specifically, the objectives

of this scoping review were to (1) describe the requirements for training family medicine

residents in the United States through the ACGME Core Competencies, (2) to describe the

methods or criteria used to measure resident competence as an autonomous physician based on

the ACGME Core Competencies, (3) to investigate the relationship between physician

competence, based on the ACGME Core Competencies, and patient satisfaction during

healthcare experiences, and (4) to identify gaps in the current knowledge relating to physician

competence, the ACGME Core Competencies, and reported patient care experiences.

BACKGROUND

Over the past several years, a number of studies have been published examining the

relationship between differing techniques for formal education and clinical training in family

medicine residency programs, and their resulting effect on physician competency and performance. The Accreditation Council for Graduate Medical Education (ACGME) has published set guidelines and standards in relation to the education and training of medical residents during their time in an accredited medical school program. *The ACGME Common Program Requirements (Residency)*, accessible on the ACGME organization website, outlines the required curriculum components in the educational program utilized in residency training, in addition to the six instructional concepts referred to as the ACGME core competencies (ACGME, *Common Program Requirements* 2020). The ACGME accreditation program sets out to encourage both innovation and excellence in graduate medical education across all affiliated originations, regardless of program funding, location, and size (ACGME, *Common Program Requirements* 2020).

Educational programs accredited by the ACGME must be designed in a manner that supports the development of skillful, and knowledgeable autonomous physicians who provide thoughtful and compassionate healthcare (ACGME, *Common Program Requirements* 2020). The five following educational components must be included in all residency curriculums affiliated with the ACGME accreditation: (1) a set program consistent with the institution's mission statement, the needs of the community served by the institution, and the desired capabilities of its graduates, (2) competency-based goals and objectives for educational experiences that are designed to promote resident progress towards functioning as autonomous physician, (3) graded supervision, progressive responsibility for patient management based on educational progress, and delineation of resident responsibilities in regard to patient care, (4) a vast range of available, structured didactic activities, and (5) advancement of resident knowledge on ethical principles

vital to the medical profession and professionalism during patient care experiences (ACGME, *Common Program Requirements* 2020).

The ACGME Core Competencies provide a structural framework that describes the required areas in which a resident must indicate competence in order to be deemed capable of autonomous practice (ACGME, *Common Program Requirements* 2020). The six following competencies are the core basis for the practical training and developing of all physicians: (1) professionalism, residents must demonstrate both commitment to professionalism and adherence medical ethical principles, such as compassion, respect for others, and responsiveness to the needs of patient above self-interest, and accountability, (2) patient care and procedural skills, residents must be able to provide appropriate and effective healthcare to all patients, (3) medical knowledge, residents must demonstrate their medical knowledge in relation to biomedical, clinical, and social-behavioral sciences, (4) practice-based learning and improvement, residents must demonstrate their ability to appraise, investigate, and evaluate their care of patients based on scientific evidence and presentation of the condition, (5) interpersonal and communication skills, residents must demonstrate both interpersonal and communications skills that result in the effective dialogue of relevant information between patients, family members, and additional health care professionals, and (6) systems-based practice, residents must demonstrate both awareness and responsiveness to the systems of health care, including the social determinants of health (SOH), as well as any other external factors that make influence patient care (ACGME, *Common Program Requirements* 2020). Both the core competencies and educational curriculum components were designed to optimize the learning experience for residents in graduate medical school programs, in order to produce autonomous practicing physicians.

In September of 2000, the Accreditation Council for Graduate Medical Education (ACGME) released the ACGME Toolbox of Assessment Methods for resident and physician evaluations (ACGME, *Assessment Guidebook* 2020). In 2020, these original assessment methods were re-evaluated and included in *the ACGME Assessment Guidebook,* published on the ACGME website, to provide guidance and descriptions of assessment methods and approaches that have proved valid in assessing the performance of both residents and medical fellows (ACGME, *Assessment Guidebook* 2020). As described in the guidelines, this guidebook does not include all techniques or tools that can or may be utilized to assess resident performance or competency, instead, ACGME is strictly providing resources to residency programs that have previously proved effective and accurate in measuring knowledge and clinical application (ACGME, *Assessment Guidebook* 2020). Currently, the assessment techniques and tools recommended by the ACGME to measure competence include: direct observation of clinical skills, direct observation of procedural skills, patient experience surveys, multisource feedback (360-degree evaluations), standardized (simulated) patients (objective structured clinical examinations), simulations, clinical performance reviews, procedure or operative case logs, faculty global assessment forms, and direct assessments of medical knowledge (examinations) (ACGME, *Assessment Guidebook* 2020). Based on the 2020 *Assessment Guidebook*, there is no standardized tool or method used to measure and evaluation individual resident competence during their resident training program.

METHODOLOGY

To evaluate the efficiency and usefulness of the current ACGME Core Competencies and Common Practice Recommendations in family medicine, I completed a literary synthesis in the

form of a scoping review, utilizing the Arksey and O'Malley scoping review framework, and PRISMA-ScR checklist for reporting results (Arksey & O'Malley, 2005), (Tricco et al., 2018). A scoping review is a technique often used in the field of medicine to synthesize a vast amount of evidence relating to a topic or area of interest (Munn et al., 2018). These types of reviews serve several purposes, including identifying relevant evidence in a specified field of interest, clarifying key definitions and concepts based on literature, examining the methods to which research is conducted and collected on a subject, and lastly, to identify gaps in current knowledge and methodologies in the area of interest (Munn et al, 2018). In contrast to systematic reviews, which synthesize and evaluate empirical data and relevant literature to draw conclusions and provide an answer to a specific research question, scoping reviews systematically identify, synthesize, and describe current literature and relevant studies to an emergent research area that has not been extensively studied (Sucharew & Macaluso, 2019).

The Arksey and O'Malley methodological framework for scoping reviews allows researchers to gather literary information in a structured and replicable manner by following six rigorous steps. This approach maximizes the relevant information collected in regard to a specified topic, regardless of the examined studies' methods or design (Sucharew & Macaluso, 2019). Carefully following the steps involved minimizes the potential for bias and influence of selective reading and interpretation of study results (Arksey & O'Malley, 2005). The first step is to identify research questions (2005). The research question should be a statement of interest, broad in scope, that is clearly phrased in a way in which a search can result in a vast number of references relating to the question (Sucharew & Macaluso, 2019). The second step is to identify relevant literature and studies. The methods for searching and identifying relevant literature may vary depending on the researcher/author and the focus on the search, but common search

strategies include electronic databases, hand searches, reference lists, presents, regulatory data, and patents (Sucharew & Macaluso, 2019). Step three is study selection, in which the researcher will examine through all relevant literature gathered in step two, and sort it based on predetermined inclusion and exclusion criteria (Sucharew & Macaluso, 2019). The fourth step is charting or extracting the data. In terms of a scoping review, the data extraction process is termed data charting, in which data is extracted from accepted sources to gather pertinent information to address the research question (Sucharew & Macaluso, 2019). Step five is to summarize and report the results found through the search, which is typically depicted in tables and charts (Sucharew & Macaluso, 2019). There is one more step, the optional step six, but this is an optional step that is not applicable to all scoping reviews. This step is a consolation event, where outsides, those who did not take part in the search review team, can read, analyze, and assess the findings determined in the scoping review. Some validate the findings of the review, while others may provide alternative insights to further expand the current realm of knowledge relating to the topic of interest (Sucharew & Macaluso, 2019).

The PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyzes extension for Scoping Reviews) checklist is often used in addition to the Arksey and O'Malley scoping review framework. The PRISMA-ScR checklist is a set of guidelines utilized to assess search literature and studies for inclusion based on the criteria included in the reports that result in good sources for data extraction (Tricco et al., 2018).

Literature search

I conducted and executed this scoping review utilizing both the Arksey and O'Malley scoping review framework approach, and PRISMA-ScR checklist (Arksey & O'Malley, 2005),

(Tricco et al., 2018). Prior to executing this review, I consulted with Oakland University's library specialist for the School of Health Sciences for assistance on understanding and designing the search algorithms for the scoping review process, including gathering information in regard to electronic database searches and keyword utilization for effective searching. Based on my consultation with the literature specialist, I finalized a search protocol for this project, including the search strategies, keyword terms, language, and date of publication criteria. I utilized electronic database searches from Library OneSearch, PubMed Central, and PubMed MEDLINE, with additional searching through reference lists of review articles relating to the areas of United States medical residency programs, the ACGME Core Competencies and milestones, and patient care experiences, to identify additional articles that may be of relevance to this project. The search keyword used in the electronic database searching included the following terms: ACGME, family medicine, and residency. Results were limited to those with a publication due from January 2010 to current 2020, and to English language. I did not include any literature or studies prior to the year 2010 as the ACGME Core Competencies and the corresponding educational methodology, through the Outcome Project and Milestones, are released in phases and are updated based on physician performance throughout evaluation years. Restricting the search criteria to the past 10 years limits the literature to the most recent studies that can accurately depict the current status of the ACGME requirements.

Study selection

Literary sources and studies were initially evaluated for inclusion based on a specified electronic database, PubMed MEDLINE, keyword terms searching, date of publication, and language. The resulting sources were then screened for inclusion, through the means of

evaluating the published title, accessibility of the source, and abstract relevance. Sources that did

not meet the inclusion criteria based on title, access, and abstract relevance were excluded from

this assessment. Next, sources were evaluated for specific criteria relating to the family medicine

residency programs, and the ACGME core competencies, through full-text reviews, based on

study design and intervention methods. Articles that did not assess the family medicine specialty,

or focused on additional sub-specialties, were excluded from this review. Additionally, articles

with research/data collected that were not based in the United States were not included as this

assessment focuses on the efficiency in training family medicine residents in the US. Sources

relevant to understanding the core competencies, evaluating physician performance, and relating

to patient care experiences were included. The specific methodological framework approach

utilized in the inclusion and exclusions of records in this search, including the numbers of

articles screened, rejected, and included, is depicted in *Figure 1* in the results section.

Data charting

   After finalizing the list of included studies, study characteristics and data were then

charted. The data charting includes author and year of publication, publication type, study

design, assessment type, assessment tools, study location, sample size, population, summaries of

results (quantitative), and summaries of outcomes. These findings are presented in *Table 1* in the

results section.

RESULTS

   The initial electronic database search identified a total of 3,602 records. After filtering the

search through the PubMed Central and PubMed MEDLINE databases, and additional records
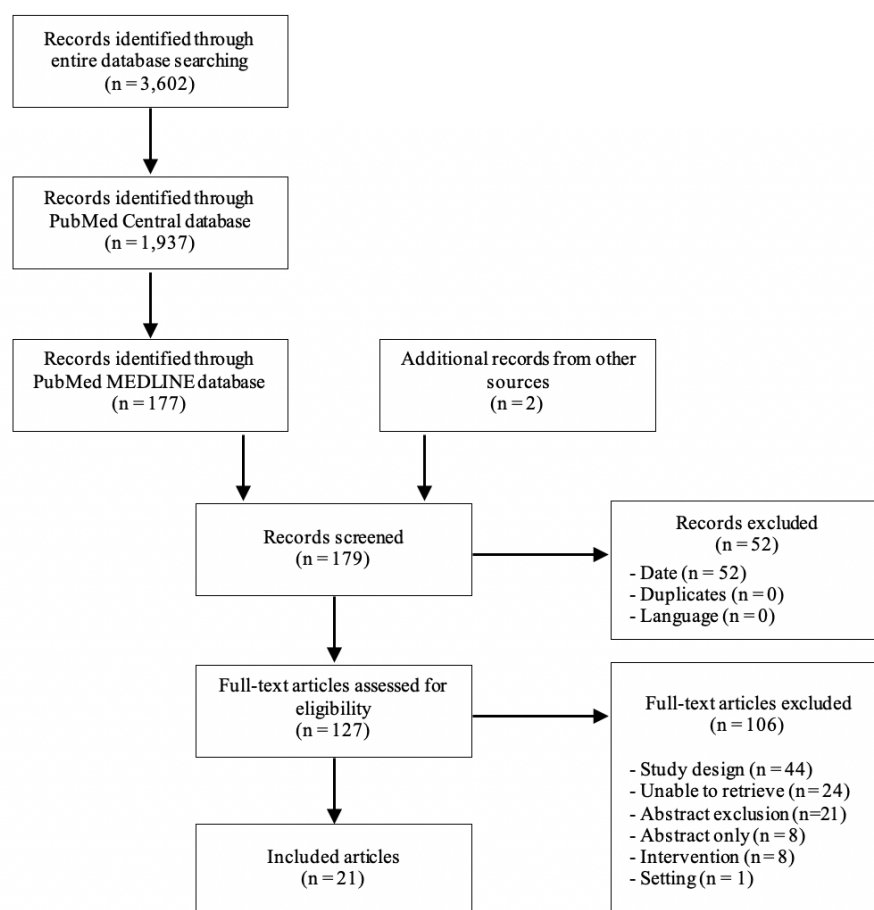
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          ┌─────────────────────────┐
          │ Records identified through│
          │ entire database searching │
          │      (n = 3,602)          │
          └─────────────────────────┘
                      │
                      ▼
          ┌─────────────────────────┐
          │ Records identified through│
          │ PubMed Central database   │
          │      (n = 1,937)          │
          └─────────────────────────┘
                      │
                      ▼
  ┌─────────────────────────┐   ┌─────────────────────────┐
  │ Records identified through│  │ Additional records from other│
  │ PubMed MEDLINE database   │  │         sources           │
  │      (n = 177)            │  │        (n = 2)            │
  └─────────────────────────┘   └─────────────────────────┘
              │                            │
              └──────────┬─────────────────┘
                         ▼
            ┌─────────────────────┐        ┌─────────────────────────┐
            │  Records screened   │───────▶│   Records excluded        │
            │     (n = 179)       │        │      (n = 52)             │
            └─────────────────────┘        │ - Date (n = 52)           │
                         │                 │ - Duplicates (n = 0)      │
                         ▼                 │ - Language (n = 0)        │
            ┌─────────────────────┐        └─────────────────────────┘
            │ Full-text articles  │        ┌─────────────────────────┐
            │ assessed for        │───────▶│ Full-text articles excluded│
            │ eligibility         │        │      (n = 106)            │
            │     (n = 127)       │        │                          │
            └─────────────────────┘        │ - Study design (n = 44)   │
                         │                 │ - Unable to retrieve (n = 24)│
                         ▼                 │ - Abstract exclusion (n = 21)│
            ┌─────────────────────┐        │ - Abstract only (n = 8)   │
            │  Included articles  │        │ - Intervention (n = 8)    │
            │     (n = 21)        │        │ - Setting (n = 1)         │
            └─────────────────────┘        └─────────────────────────┘
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Figure 1. Flow diagram of study retrieval, selection, and exclusion.

from other sources gathered via reference list searching, a total of 177 studies screened and evaluated as potentially relevant articles. Of the 177 records screened, 52 were excluded due to publication date, while none were excluded for language or duplications. A total of 127 full-text records were assessed for eligibility based on the set inclusion criteria. The full-text assessment resulted in the exclusion of 106 articles, with the majority attributed to study design (n = 44), and the inability to retrieve the published works (n = 24). A final total of 21 articles met the inclusion criteria and were included in this review (*Figure 1*).

   Table 1 provides a summary of the study characteristics, including study design, assessment method and tool, sample size, results and outcomes. The studies included in this review were published between 2010 and 2020 (median: 2017) and were conducted across 8

different states in the United States. Of the 21 articles included in this review, nine were quantitative, five were qualitative, and seven were both quantitative and qualitative in study design. The nine studies of quantitative nature included the use of questionnaires, surveys, and examinations to assess resident performance. Two of these nine studies were experimental in nature, with one being a quasi-experimental study (Webb, Young, & Baumer, 2010), including the use of both a treatment and control group during curriculum exposure, the independent variable, to study its resulting effect on resident performance, the dependent variable. The five studies of qualitative nature included one article that utilizing written assessments to evaluation competency, while the other four were literature reviews focused on the relationship between resident performance and the residency program's educational curriculum and evaluation methodologies utilized. The seven studies that were both quantitative and qualitative in nature included the additional use of written reflections, interviews, surveys, observational assessments, and data analysis to report their results in both numerical and descriptive manners.

The 21 articles reviewed were categorized in correlation to the aims of this scoping review. Aim 1 sought out to describe the requirements for training family medicine residents in the United States through the ACGME Core Competencies, was addressed in the background section of the introduction to this review. The results of Aim 1 included the description of achievements residents must perform, or demonstrate competence in, during their training. Aim 2 sought out to describe the methods or criteria used to measure resident competence as an autonomous physician based on the ACGME Core Competencies. 15 sources were identified in relation to Aim 2. The results of Aim 2 include the description of different evaluation methods, such as direct observations and feedback, currently utilized to assess and measure resident competence or knowledge. Aim 3 sought out to investigate the relationship between physician

competence, based on the ACGME Core Competencies, and patient satisfaction during healthcare experiences. 3 sources were identified in relation to Aim 3. The results of Aim 3 demonstrated a significant relationship between resident competence and patient satisfaction during care, which could be attributed to evaluation methodology or curriculum design. Lastly, Aim 4, sought out to identify the gaps in current knowledge relating to physician competence, the ACGME Core Competencies, and reported patient care experiences. 5 sources were identified in relation to Aim 4. The results of Aim 4 demonstrate a discrepancy between resident training evaluations and later career practice with low patient satisfaction.

Aim 2 – methods and criteria for measuring competency

In relation to Aim 2, 15 studies utilized tools recommended in the ACGME *Assessment Guidebook* to evaluate resident knowledge and skills, noting that some studies reported the use of multiple tools in conjunction with others. The tools endorsed by ACGME that were included in this review included: direct observation (n = 6), examinations (n = 5), 360-degree multisource evaluations (n = 2), patient surveys (n = 1), and simulations (n = 1). 11 studies utilized differing methods to evaluation resident competence, including: full program assessments (n = 5), written narratives (n = 3), peer assessments/observations (n = 2), and case study/scholar research assessments (n = 2), that were not included in the Assessment Guidebook from the Accreditation Council for Graduate Medical Education. 3 studies did not reference any tools or methods to assess resident competence or performance.

Two studies that utilized the direct observation method for evaluating resident programs utilized the mobile application feedback system M3App, that was designed to track and record resident progress in reference to completing the ACGME milestones, in addition to providing

direct feedback based on observable behaviors (Page et al., 2017). One of these studies included

the recording of 886 observational reports on resident performance, with 97% of the reports were

in regard to positive behaviors observed, while 6% of observed behaviors were deemed

actionable and in need of improvement (Page et al., 2020). The same study indicated that 56% of

the observations were labeled as related to the ACGME core competency of patient care, while

communication and professional followed with 47% and 38% respectively, and practiced-based

learning and improvements was the lowest identified competency related to the behavioral

observations with 16% occurrence (Page et al., 2020). Additionally, the results of the other

indicated that faculty who tried the M3App were 29 times more likely to agree that the mobile

feedback improved their observational feedback (Page et al., 2017).

Two studies utilized 360-degree multisource evaluations in which multiple different

respondent groups were utilized to evaluate resident performance. One study in particular

implemented the 360-degree multisource evaluation utilizing four 10-item questionnaires

designed to evaluate the interpersonal and communication skills of residents based on a 5-point

Likert scale (Chandler et al., 2010). As the focus of this study was resident performance, four

different groups of respondents, including residents, faculty, nursing staff, and patients/families

were included (Chandler et al., 2010). 836 evaluations were completed on 66 eligible residents.

All evaluators scores resident highly with a mean score range from 4.4 to 4.9, out of a maximum

5 (Chandler et al., 2010). The faculty and nursing staff scores residents higher than

patients/families by 0.32 and 0.30, respectively (Chandler et al., 2010). Resident self-evaluations

were lower than faculty and nursing staff scores by 0.43 (Chandler et al., 2010). Resident self-

evaluations and patient/family scores did not differ statistically (Chandler et al., 2010).

Another study implemented an evaluation method that is not included in the recommendations from the ACGME Assessment Guidelines. This study utilized written narratives and the Dreyfus levels of observable behaviors to categorize resident performance based on six assessment tools (Baglia et al., 2011). 52 narratives were collected from residents and faculty, which then were categorized based on their relevance to the ACGME core competencies in order to create six assessment tools to evaluate performance in each category. 188 observable behaviors relating to the ACGME core competencies were identified (Baglia et al., 2011). Residents were then measured in each respective category through the means of peer reports and feedback, observable behavior, and knowledge assessments. Results of this study showed resident behaviors shifted towards performance with patient care and professional conduct based on the narrative framework, in contrast to previous behaviors focusing on achievable scores (Baglia et al., 2011). These results do not indicate all of the findings throughout the studies that examined the effectiveness of evaluation methods.

Aim 3 –identifying the relationship between competence, the competencies, and patient care

In relation to Aim 3, 3 sources examined the relationship between physician competence assessed through techniques or tools relating to knowledge in regard to the ACGME Core Competencies, and patient satisfaction during healthcare experiences. One study, done by Holt, Miller, and Nasca, utilized descriptive statistics, including the means, frequencies, and percentages, to assess the usage of different evaluation methods and assessments reported to the ACGME database from all accredited residency training programs (2010). At the time of this study, 44% of all accredited residency programs (n = 4,417) recorded their assessment methods and evaluators with the ACGME database (Holt, Miller, & Nasca, 2010). 97% of these programs

reported using at least one assessment method and evaluator type, with the mean number of assessments per competency are ranged from 2.7 (for systems-based practice) to 8.2 (for professionalism) (Holt et al., 2010). The most common reported evaluation methods were direct evaluation and global assessment with 90.9% and 81.1% respectively (Holt et al., 2010). 28% of programs reported the use of patient surveys to assess the 4 ACGME core competencies relating to patient care (Holt et al., 2010).

Another study evaluated the integration of teaching family topics into the curriculum requirements for family medicine residency programs to resident knowledge and patient satisfaction. 61.1% of residency program directors and 69.6% of chief residents (CRs) studied believe that integrating family concepts or skills into their programs is important (Korin et al., 2014). 95.2% of the chief residents noted that interpersonal/communication skills were emphasized in their teachings, while only 60.1% noted an emphasis on family concepts (Korin et al., 2014). Additionally, it was reported that the challenges in implementing the family approach into the teaching are due to competition with other curricula (70.8%), and lack of interest by learners (23.0%) (Korin et al., 2014).

Aim 4 - gaps in current knowledge relating to competence, evaluations, and patient satisfaction

In relation to Aim 4, 5 sources identified gaps in the current knowledge relating to physician competence, the ACGME Core Competencies, and reported patient care experiences. One study evaluated the keyword terminology in the ACGME milestones, a set of skills or knowledge areas that residents should meet by a certain point in their education, in relation to resident performance. This result of this study identified 546 terms in the ACGME milestones identified that are related to the ACHME competencies (Michael, Rougas, Zhang, & Clyne,

2019). Of those occurrences, 40% were related to residents as learners, while only 26% related to

patients and families included in the care experience (Michael et al., 2019). In another study,

residency program directors were surveyed to assess their opinion on some of the components

taught in their respective program's curriculum. Results of this study indicated that residency

accreditation requirements, such as achieving the ACGME milestones, were ranked as most

important with a score of 2.2 (with a score of 1 being most important), while learning

opportunities scored a 2.5 (DeGette, Knox, & Bodenheimer, 2020). In the introduction to this

study, the authors noted the discrepancy between resident training and career practice that often

results in unprepared residents, yet, there was no mention of ability to practice autonomously, or

in regard to patient-focused care in this priority assessment completed by the resident directors

(DeGette, Knox, & Bodenheimer, 2020).

A wide range of outcomes relating to resident competency and evaluations were reported

across the studies. The outcomes most frequently referenced include: the ACGME core

competencies (n = 21), resident competence or knowledge (n = 20), techniques or tools used to

assess resident performance (n = 18), patient satisfaction (n = 17), and resident educational

curriculum (n = 14). The implications from results and outcomes of the studies included in this

review will be examined and assessed in the following discussion section.

DISCUSSION

A number of critical patterns emerged throughout the assessment of the 21 studies. This

scoping review identified 21 studies related to the evaluation of resident competence during their

training in an accredited residency program based on the six ACGME core competencies. The

majority of these studied examined the association between different techniques or tools of

assessment to resident knowledge or performance. While the significance of assessing resident knowledge during their training program is key in predicting their patient care practices as an autonomous physician, there are no current guidelines in place that standardized the type of assessment methods that should be utilized to assess such knowledge. Taken together, a number of thematic patterns emerge that illustrate ways in which residency assessment may move towards more standardized, thorough and useful approaches, improving resident performance and patient satisfaction.

The impact of direct observation depends on who does the observing

The included studies described and evaluated different methods that can be used in the assessment of resident knowledge. The majority of such studies show that direct observation is the most commonly used assessment method to evaluate resident competency during their training. One study indicated improvement in resident performance based on direct observation and feedback provided from peer residents (Page et al., 2020). The results suggested that peer feedback plays an important role in resident assessment, and that peers are able to provide constructive comments on observed behaviors or actions that faculty members typically do not see. Another study also suggested that relying on only a select group of evaluators, such as faculty, does not provide accurate assessments with enough feedback to improve resident learning and development (Holt et al., 2010).

Programs that reported the use of patients as evaluators showed high patient-relating data in which residents were competent and prepared to practice medicine independently (Holt et al., 2010). In the study done by Chandler et al., it was reported that all residents score highly on the evaluations, yet patients/families evaluated residents lower than faculty and nursing staff (2010).

This highlights the potential need for improvements in professionalism and communication with patients/families to improve care. The difference in scores reported between evaluations may be attributed to the differences in the way residents interact with members of care team compared to patients and families. Results from different evaluators can provide a more complete view of resident performance in different settings throughout practice and care (Chandler et al., 2010).

Multiple measurement modalities produce better performance results

In contrast to direct observation, other studies suggested the use of 360-degree evaluations, or multisource evaluations, that are made up of multiple different methods of concept assessments and types of evaluators. One common method of assessment that is frequently included in multisource evaluations, or as a stand-alone, is the use of written reflections or narratives. A study included in this review demonstrated the ability for residents to acknowledge and identify growth, and achievement of ACGME milestones, especially those that are not evaluated in the clinical setting, including the skills relating to patient care, such as an understanding of culture, humanism, and community (Grissom, Iroku-Malize, Peila, Perez, & Philippe, 2017). The results also indicated that writing reflections increased empathy and development of professional identity, and cultural competence in relation to ACGME core competencies (Grissom et al., 2017). Another study revealed that there are potential advantages to utilizing competency tools such as 360-degree evaluations to assess resident performance as they are able to provide a well-rounded assessment of resident behavior from both self-reporting, and observations of others (Webb et al., 2010). Results from Webb et al. revealed in previous studies, concern have arisen in regard to patient care, with dehumanization in medicine, including less compassionate care, and decrease in empathy and enthusiasm in care provided by

the physician (2010). Utilization of multisource tools will enhance patient care experiences as

ability to understand and perform in a competent manner relating to the ACGME core

competency requirements have been correlated to improving medical outcomes, patient

satisfaction, and physician satisfaction (Webb et al., 2010). One study referenced the importance

of utilizing different methods of evaluation for measuring the six ACGME Core Competencies.

As the core competencies relate to different areas to medicine and patient care, including medical

knowledge, and interpersonal and communication skills, there is no assessment that can

accurately evaluate all components of these competencies. Differing methods of evaluations

should be used to quantitatively and qualitatively assess resident performance (Peabody, O'Neill,

& Peterson, 2017).

Lack of focus on family in family medicine

Additional sources also referenced the impact of criteria included in the educational

curriculum competent of resident training and its resulting influence on patient care experiences.

One source indicated that the teaching of family topics in residency programs are less

emphasized compared to other curricula (Korin et al., 2014). As a result, these programs suggest

that family is not a topic distinctly taught or included in current education programs (Korin et al.,

2014). Programs that do include family-oriented skills report higher resident performance on

evaluations that relate to family skills and patient care experiences (Korin et al., 2014). A

different studied evaluated the implementation of a longitudinal curriculum relating to the

ACGME standards for QI and patient safety training. The curriculum implemented seemed to be

successful based on the results of this study, which indicated that residents improve in

competence in areas of quality improvement (QI), chronic care management, and patient safety

skills (Potts, Shields, & Upshur, 2016). The authors made note that utilizing a curriculum with hands-on experience results in residents who self-report higher levels of knowledge and practice-based skills, leading to confidence in their role as a leader during patient interactions (Potts, Shields, & Upshur, 2016). These sources indicate that residency competence also affects the concepts and materials included in their residency training curriculum. Changing such curriculum to include aspects relating to family, ethics, and safety could improve resident knowledge and competence, in addition to improving patient satisfaction during care experiences.

Gaps in current measurement approaches

Based on the extant literature assessed in this scoping review, there are gaps that exist in the current education and evaluation of residents during resident training programs, prior to residents becoming autonomous physicians. One study noted that tools or changes in curriculums should be adapted to improve transparency of expectations between learners and educators, as well as having the ability to provide direct feedback on performance (Jarrett, Antoun, & Hasnain, 2019). Such assessments need to include specific feedback in a timely manner, with frequent repetition, to assess progress of the learner as the faculty should change/alter teaching methodology to make up the lack of understanding in resident performance/knowledge (Vanderbilt, Perkins, Muscaro, Papadimos, & Baugh, 2017). Another study noted that a universal evaluation tool for resident performance/competency is needed to quantitatively analyze the effect across residency programs nationwide as all residents should be held to the same assessment standards (Locke, Gordon, Guerrera, Gardiner, & Lebensohn, 2013). Currently, there is a gap in resident knowledge and their performance on the American Board of Family

Medicine Certification Examination in which residents, who are about to certified as autonomous

practitioners do not meet the pass rate standards set by ACGME, indicating a lack of resident

knowledge of learned during their residency education, a direct result of the varying methods

used to measure resident competence during their training period.

Implications for residency programs

Although this review found no evidence by which it can state one method of assessment

that proved to be best for evaluating resident competence, concepts and assessment principles

known to promote improvements in resident knowledge and skill have been identified.

Multisource surveys and evaluations, including the use of peer reviews and patients, indicated

constructive feedback and improvements in resident performance on evaluations, and increased

patient care satisfaction. Written narratives proved useful as resident's observable behaviors

shifted from focusing on benchmark scores, to patient-centered care and professional conduct.

Additionally, the use of a mobile application to track resident progress and achievement of

ACGME milestones, and to provide instantaneous feedback on observable behaviors also proved

to be influential in improving resident competence. Therefore, the integration of such tools and

techniques into residency programs nationwide is needed. A compilation of multisource

evaluations, with differing methods and evaluators, is key in observation and understanding full

resident capabilities in relation to their ability to provide satisfactory patient care.

Study limitations

Due to the sizable number of studies that can be included in a scoping review based on its

broad nature, a structured search strategy must be utilized to refine searches to the most relevant

literature. Despite my best efforts to complete a comprehensive review of all materials relating to

my topic of interest, it is possible that some pertinent studies may have been excluded or left out.

This study was limited to materials published within the years 2010 to 2020, in the English

language, located in the United States, that related to specified keyword search terms. Any works

of literature or studies that did not meet these criteria were excluded from this review and may

not be represented in the analysis presented.

   Another limitation of this review relates to the reporting of all results and data collected

based on the literary assessment. This review did not report all of the results presented in the

literature included in this evaluation as not all of the data collected, including the representation

of the observed results, pertains to the scope of this assessment, and therefore was excluded. This

may result in the evidence selection bias or skewing of the reported results.

CONCLUSIONS

   A vast range of studies, including various study designs, assessment tools, and outcomes

have been used in the evaluation of assessment methods for determining resident competence

and knowledge. Currently, the evidence relating to the effectiveness of different techniques on

assessing resident competence in the terms of its effect on patient care and satisfaction is limited

and inconclusive. A standardized multisource assessment technique, including the use of

differing competence assessment methods and evaluators tailored to each of the six ACGME

competencies is needed to ensure proper training of all residents in residency programs

nationwide. This review described in detail some of the assessment techniques for resident

knowledge and performance that are currently implemented in training programs across the

United States. Some of the studies recommended the use of assessment tools endorsed by the

Accreditation Council for Graduate Medical Education, while others suggested the use of different methods that are not currently suggested by the ACGME. All of the studies assessed did indicate the effectiveness of implementation of knowledge assessments during training, though the scope of this review cannot recommend one technique over another.

In the future, a meta-analysis or systematic review should be done to further assess this subject as a scoping review cannot determine the correlations between the physician performance in relation to the standardized ACGME core competencies based on differing evaluation techniques and its implications on patient satisfaction and experiences during care interactions. The nature of this review only allows for the description of the general trend of current literature and data relating to the topic at hand. Literary research and experimental studies should be completed to identify the correlation between assessments of resident competency and patient satisfaction during care experiences. Additionally, further research may reveal what multisource assessment methods should be recommended for the standardized assessment of resident competence during training nationwide.

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Table 1

Author, Year, Sample, Location	Assessment Tool	Population	Summary of Results (Numbers in Results Section)	Summary of Outcomes (Summarization of what was found/what it means)
(Ambrose, Lin, & Chun, 2013)	0-3 scoring criteria	n/a	FM = 3/3 ; 44% (12 main specialties) out of 27 scored 1 or higher ; 4 out of 5 primary care specialties (FM, peds., psych., OBGYN, int. med) scored a 3	Primary care specialties, including FM residents, have more intensive patient interactions, and therefore, have more mentions of cultural keywords and guidelines in their training requirements. FM residents noted having received more formal training to develop cultural competency skills.
(Baglia et al., 2011) n = 19, Pennsylvania	Written narratives, Dreyfus levels of observable behavior, 6 learning site tools	Faculty	In 52 narratives collected, 188 observable behaviors relating to the ACGME Core Competencies were identified. 4 levels of performance were defined	Based on written narratives from faculty and residents, observable behaviors were identified and then classified based on the six ACGME competencies. They were then related to a Dreyfus performance level and assessed through 6 evaluation tools. These results showed that resident behaviors shifted towards performance with patient care and professional conduct, instead of trying to reach "achievable" scores.
(Chandler et al., 2010) n = 823, North Carolina	360-degree evaluations. (4) - 10-item questionnaire on a 5-point Likert scale	Residents, faculty, nursing staff, and patients/families	All evaluators scored residents highly with a mean score range from 4.4 to 4.9 ; MDs and RNs scored residents higher than P/Fs by 0.32 and 0.30 respectively ; resident self-evaluations were lower than MD/RN scores by 0.43 ; self-evaluation and P/F scores did not differ	All residents score highly on the evaluations, yet P/Fs evaluated residents lower than MDs and RNs. The different in scores reported between evaluate may be attributed to the differences in the way residents interact with members of care team's vs patients/families. These results from differing evaluators provide a more complete view of resident performance in different settings throughout practice and care.
(DeGette, Knox, & Bodenheimer, 2020) n = 11 (survey), 9 (interview), California	9-item survey	Residency program directors	16% response rate ; residency accreditation requirements ranked most important with a 2.2 (with a 1 being highest priority) ; learning opportunities ranked 2.5	This survey assessed residency program director's opinions on factors that influence resident inpatient and outpatient training. The results showed the ACGME requirements and learning opportunities ranked highest for those who participated in the study for priory in training and educating residents.
(Grissom, Iroku-Malize, Peila, Perez, & Philippe, 2017) n = 12, New York	Mixed-methods data analysis based on milestone frequencies in writing	Residents	Milestone references ranging from 16 to 42 ; mean number of references = 24.92 ; systems-based practice milestone referenced the most with 37 times, professionalism milestone 35 times, and practice-based learning milestone 29 times	Written reflections demonstrate the ability for residents to acknowledge and identify growth and achievement of ACGME milestones, especially those that are not evaluated in the clinical setting. Writing reflections increased empathy and development of professional identity and cultural competence in relation to ACGME competencies.
(Jarrett, Antoun, & Hasnain, 2019) n = 267	CERA cross-sectional survey	FM residency program directors	90.1% of program directors are aware of the EPAs as an assessment framework for resident performance ; 30.6% ranked increased transparency of expectations between learner and training program as the number one benefit ; facility feedback based on competency was the second highest ranked benefit by 25%	The results of this study indicated a lack of utilization for tools, like Entrustable Professional Assessments, to assess resident performance and competence. There is a need for a consensus on which tool, specified set of EPAs, should be the preferred list to evaluate resident progress. As the program directors note that those who use EPA noted improvements in program directors note that transparency of expectations between learners and educators, as well as having the ability to provide direct feedback on performance.
(Korin et al., 2014) n = 489	20-item BSF survey, 9-item PD survey, and a 7-item CR survey	Program directors (PD), behavioral science faculty (BSF), and chief residents (CR)	61.1% of PDs, 69.6% of CRs believe that integrating family concepts into their programs is important ; 95.2% of CRs noted that interpersonal skills were emphasized in teachings, with only 60.1% noting emphasis on family ; Challenges reported in competition with other curricula (70.8%), and lack of interest by learners (23.0%)	The teaching of family topics in current residency programs are less emphasized compared to other curricula. Programs that do include family-oriented skills report higher resident performance on evaluations that relate to family skills and patient care experiences. This study suggests that a new curriculum or standard should be recommended that include family-based skills into the resident learning requirements.

Table 2 (cont.)

Author, Year, Sample, Location	Assessment Tool	Population	Summary of Results (Numbers in Results Section)	Summary of Outcomes (Summarization of what was found/what it means)
(Manson, Satin, Nelson, & Vadiveloo, 2014) n = 178	47-item questionnaire	Program directors, and faculty	4.5% of residency programs surveyed do not formally teach any ethics topics ; 95.5% teach at least one of the listed ethics topics on a formal basis ; 3 programs explicitly aligned their ethics program with the ACGME core competencies and outcomes	Only 3 programs have curriculum that include ethics topics that related directly to the ACGME competencies. Based on resident performance on assessment from programs that have integrated ethics into their learnings, the authors suggest that a single educational curriculum relating to ethics will increase the likelihood of residents improving their practices and communication skills in relation to ethics topics.
(Michael, Rougas, Zhang, & Clyne, 2019)	Multi-phase document written content analysis with statistical analysis	ACGME milestone documents	Of the 16 keywords identified, 546 relevant terms were reported relating to ACGME milestones and resident education ; 296 occurrences (54%) were within the level 5 milestones ; the competency with the highest term occurrence was patient care	The milestones are ranking in five ascending levels from beginner to aspirational level of proficiency. The results of this study indicated that the ACGME milestones as current focused on experience and medical knowledge to evaluate performance, not education skill set or learning. The results indicate that these milestones are not effectively alone in assessing resident competence, and that frequent feedback or additional assessment tools should be utilized.
(Page et al., 2020) n = 886, North Carolina	M3App	Residents	The most observed CC was patient care with 56% ; communication and professionalisms following with 47% and 38% ; PBL and improvements was the least observed with 16% ; 97% of the observations made were positive, with actionable and constructive following with 85% and 6 %	This study supported previous claims that feedback is a well utilized assessment tool for resident performance and competence based on the ACGME milestones, with direct observations being the most common assessment tool used by faculty. Results indicate that peer feedback plays an important role in resident assessment, and that peers are able to provide constructive comments on observed behaviors or actions that faculty members typically do not see. A compilation of multisource evaluations is key in observing and understanding full resident capabilities.
(Page et al., 2017) n = 7, North Carolina	M3App	Residency programs	Faculty observations of ACGME milestones occurred 4.9 time more likely with M3App ; positive responses relating to the app ranged from 68% to 70%, with users being 29 times more likely to agree that the app improved feedback; residents note that they received good feedback more than 2 times more likely that prior	Results indicated that this app improved assessment of resident knowledge and behavior as they were able to get a timely, detailed response to observed actions. This resulted in more constructive and positive feedback given to the residents are faculty tended to record more observations via the app as it was easy to use. Prior to this implementation, faculty would spend on average 45 minutes per resident recording comments and behaviors, which led to the skewed reporting of only behavior that needed improvement.
(Peabody, O'Neill, & Peterson, 2017) n = 476 (residency programs), 10,563 (residents)	FM Milestone Ratings reported in the ACGME database and Post Hoc analysis	Residency programs and residents	n/a	The results of the study indicated that the milestones do indeed track resident progress, but in a manner that cannot conclude competence. Instead of indicating knowledge or ability, the milestones indicate the point at which the resident is located at in their current training, and the relationship seen between level of milestones and ability is due to the framework design as educational ability increases with time and exposure to learning materials. Differing methods of evaluations should be used to quantitatively and qualitatively assess resident performance.
(Pohl, Van Hala, Ose, Tingey, & Leiser, 2020) n = 2, Utah	Curriculum implementation and statistical analysis	Residency programs	The mean scores for problem-based learning and improvement aim 3 (PBL-3) increased significantly for both classes, year 2017 from 1.4 to 4.6, and year 2018 from 1.4 to 4.4 ; participation in optional QI scholarship increases	As of 2012, all medical specialties must be trained in quality improvement (QI), and be active in completing scholarly projects. The use of QI training and scholarly projects is to enhance leadership skills in order to achieve higher levels of patient care. The study aimed at evaluating the efficiency of the 2012 SEE-QI curriculum in improving resident competence on the PBL-3 milestones, scored by the CCC rubric. Results found that after completing the curriculum, residents showed a substantial increase in PBL-3 scores, and therefore will lead to resulting improvements in patient care.

Table 3 (cont.)

Author, Year, Sample, Location	Assessment Tool	Population	Summary of Results (Numbers in Results Section)	Summary of Outcomes (Summarization of what was found/what it means)
(Sayre, Toklu, Ye, Mazza, & Yale, 2017)	Case study curriculum implementation	n/a	n/a	Currently, there is a debate amongst physicians in regard to the value of case reports in graduate medical education with evidence-based medicine practices (EMB). This review suggests the potential educational significance of utilizing case reports and studies in residency training as they are a beneficial learning tool as they all residents to evaluate and apply the ACGME core competencies to specific cases where they can enhance their critical thinking, problem-solving and decision-making skills.
(Sukalich, Elliott, & Ruffner, 2014) n = 55, Ohio	21-item medical knowledge assessment, 21-item self-efficacy assessment on a 9-point Likert scale	Residents	Resident self-efficacy increased from pretest to posttest from a mean score of 119.6 to 150.3 ; no significant difference was noted in the scores reported in self-debrief vs. faculty debriefing ; no significant different was noted in resident medical knowledge between the two tests	This study was designed to evaluate the implementation of simulations, in addition to self-assessment and debriefing, to teach and assess resident competence in relation to disclosing medical errors. The results of this study noted significant improvement in the 8 assessment questions relating to the ACGME core competencies through the means of the post self-assessment, indicating that the simulation teaching/assessments are a useful tool that can be easily replicated in other settings of medicine. The study suggests that a standardized assessment tool be adapted in resident evaluations as it can provide constructive feedback to improve learning and knowledge.
(Vanderbilt, Perkins, Muscaro, Papadimos, & Baugh, 2017)	ACGME milestone assessment review	n/a	n/a	The author made note of annual assessments, including the national board of medical examiner's exam, yet these only assess knowledge context, and not clinical reasoning and application. The author states the medical school graduates do not meet the level 1 milestones when they initially transition to their clinical program. Based on this, the author suggests a standard, systematic evaluation methods to assess residents' clinical skills. These assessments need to include specific feedback in a timely manner, with frequent repetition, to assess progress of the learner as the faculty should change/alter teaching methodology to make up the lack of understanding in resident performance/knowledge.
(Webb, Young, & Baumer, 2010) n = 42, Texas	Curriculum intervention and the 72-item Emotional and Social competence Inventory (a 360-degree evaluation)	Residents	Achievement orientation had a significant difference between groups with self-ratings of 3.75 and 4.17 ; AO had the highest ratings for competency ; ratings by others were significantly higher than self-ratings for every competency	The study reveals that there are potential advantages to utilizing competency tools such as 360-degree evaluations to assess resident performance as they are able to provide a well-rounded assessment of resident behavior from both self-reporting, and observations of others. Utilization of such tools will enhance patient care experiences as ability to understand and perform in a competent manner relating to the ACGME core competency requirements has been correlated to improving medical outcomes, patient satisfaction, and physician satisfaction.
(Wiemers, Nadeau, Tysinger, & Fernandez Falcon, 2018). n = 1, Texas	Annual Program Review for Educational Effectiveness (APREE), SWOT analysis, SMART goal identification, and action plan creation	Residency program	n/a	This review discussed the review framework utilized by a residency program in Texas in correlation with APREE required by the ACGME. The results of this review indicate a significant increase is resident performance on the ABFM certification exam via pass rates as the program implemented changes identified previous years to increase resident knowledge and training. Additionally, this review noted improvements in scholarly research and clinical skills as some of their program's adjustments included increase in scholarly work to present at conferences, and the usage of interactive didactics that relating to common issues in residency education.

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